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COMING SOON

A practical, simple and accurate method of plating on lead alloys, pewter and Britannia.

How an aqueous solution of platinic chloride may be applied to porcelain and ceramics to obtain a conducting coating of pure platinum.

An attempt at summarizing, in reasonably simple form, the present state of knowledge of the structure of electrodeposits.

The history and development of plating in the automotive industry.

A new method of determining porosity of metal coatings on zinc-base die-castings.

Founded as Metal Industry, January, 1903
by Palmer H. Langdon, 1868-1935

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LEA COMPOUND

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CASE STUDY #1

Material: Brass.
Article: Escutcheon plates, and other builders' hardware.
Method of Forming: Wrought.
Final Finish: Imitation Butler silver.

Lea Method:

1. 120 grease set-up wheel.
2. Clean by acid dip.
3. Lea Compound Grade "N" on 10" diameter loose muslin buff 64/68 at 1800 r.p.m.
4. Nickel plate.
5. Lea Compound Grade "N" or "F" on 10" diameter loose muslin buff 64/68 at 1400 r.p.m.

Remarks: The Lea Method gave a better imitation of silver and materially lowered costs by eliminating cut-down buffing operation formerly used after the polishing step, and all cleaning and drying after final satin finishing operation.

CASE STUDY #2

Material: Brass.
Article: Escutcheon plates, door handles, etc. All types of builders' hardware.
Method of Forming: Cast.
Final Finish: Brushed brass.
Lea Method:

1. 120 set-up wheel.
2. Lea Compound Grade "N" on 10" loose buff at 1500 r.p.m.
3. Lacquering.

Remarks: Lea Method eliminated the additional set-up wheel operation, cut-down buffing, cleaning and drying, and replaced the messy wet scratch brush step.

CASE STUDY #3

Material: Plastic (black Bakelite).
Article: Knife handles.
Method of Forming: Molding.
Final Finish: High lustre.
Lea Method:

1. 180 dry belt sanding to remove heavy gates.
2. Lea Compound Grade "C" on a 10" diameter 1:1 packed muslin buff at 1750 r.p.m., for the removal of the parting line, and the marks at the end from the previous belt operation.
3. Cut-down buffing with Grade 306 Black Learok on a 12" diameter loose muslin buff at 1750 r.p.m.
4. Lustre buffing with Grade 304 Black Learok on a 12" diameter loose muslin buff at 1750 r.p.m.

Remarks: Lea Compound on a packed buff is able to get in and out of finger grips on the handle and remove the parting line without any danger of burning. If a high lustre is not required, the smooth finish produced by Grade 306 Black Learok will be sufficient.

CASE STUDY #4

Material: Brass.
Article: Pocketbook ornaments.
Method of Forming: Stamped from sheet.
Final Finish: Dull gold plate.
Lea Method:

1. Lea Compound Grade "S" on side of 6" medium hard felt wheel at 3600 r.p.m.
2. Lea Compound Grade "S" on 5" cloth buff at 1200 r.p.m.
3. Gold plate.
4. Lacquering.

Remarks: The desired dull finish is produced by the Lea Method without any scratch brushing on the gold plate. The thickness of gold can therefore be decreased.

CASE STUDY #5

Material: Zinc.
Article: Automobile hardware.
Method of Forming: Die casting.
Final Finish: Bright chromium.
Lea Method:

1. 150 set-up wheel on flash.
2. Lea Compound Grade "C" on 12" sewed buff at 2500 r.p.m.
3. Copper plate.
4. Cut and color buffing with Grade 155 Learok.
5. Bright nickel plate.
6. Chromium plate.

Remarks: Flexible polishing with Lea Compound removes the irregularities in the surface left by the hard set-up wheel required to remove sharp, heavy flash. A smooth surface is produced on the zinc without lubrication, minimizing cleaning before plating.

CASE STUDY #6

Material: Zinc.
Article: Interior trim for automobiles.
Method of Forming: Die casting.
Final Finish: Brush nickel plate.

Lea Method:

1. 120 set-up wheel.
2. Lea Compound Grade "C" on 12" pocketed type buff at 1800 r.p.m.
3. Nickel plate.
4. Lea Compound Grade "F" on the same type buff at 1200 to 1500 r.p.m.

Remarks: Flexible polishing with Lea Compound is substituted for cut-down buffing plus wet scratch brushing. The final Lea Compound operation leaves the work ready for assembling without cleaning and drying.

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METAL FINISHING

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A New Series of Articles

Every once in a while, research and development chemists will object that an article on a subject of interest is not warranted because the subject matter has been published previously. This reasoning may be valid in the case of the journal of a scientific society but, in our opinion, does not take into account the requirements of the production man and the limitations of his reference sources. A literature search, involving some possibly obscure scientific publications, is not especially difficult for an experienced researcher but. for the shop man, it presents an often insurmountable barrier because of distance from sources of information and lack of time.

It is the obligation of a trade publication not only to keep its readers up to date on new developments but also to provide them with compilations of data on pertinent subjects and surveys of suggested and established processes for ready future reference. This also includes what might be considered fundamentals, which should be published at intervals for the benefit of the newcomer in the field.

Some time ago we read an extended review of the field of finishing light metals, which appeared in a British contemporary publication, SHEET METAL INDUSTRIES, and was easily recognizable as the most complete survey to date of a subject of major importance to the metal finisher. Dr. Wernick, a prominent British consultant, who is better known to American readers as secretary of the INSTITUTE OF METAL FINISHING, formerly the ELECTRODEPOSITORS TECHNICAL SOCIETY, and editor of its Bulletin, has been prevailed upon, together with Mr. Pinner, to revise the data and bring it up to date for the readers of METAL FINISHING.

The survey will prepare the reader with a discussion of the various types of light metal alloys and their characteristics, from which it will progress to the surface treatments, mechanical, chemical, and electrochemical, in complete detail. It is expected that the data presented in this series of articles will appear shortly in book form to provide an important addition to the metal finisher's library. With the kind permission of our British contemporary and with the certainty that our enthusiasm over this monumental work will be matched by the approval of our subscribers, we are happy to present in this issue the first article of the series.

Nathaniel Hall

Surface Treatment and Finishing of Light Metals

Part I. Development, Applications and Finishes

By S. Wernick, Ph.D., M.Sc., F.R.I.C., F.I.M. and R. Pinner, B.Sc.

THE history of the light metal industry, as that of certain other industries of this century, is one of intense and ever accelerating expansion and development.

There are few people today who are not familiar with a great number of modern applications of aluminum and its alloys. The part it plays in our everyday life is such that it is difficult to realize that fifty years ago the metal was still a rarity.

The excellent corrosion resistance of pure aluminum is largely due to its affinity for oxygen; this results in the production of a very thin but tenacious oxide film which covers the surface as soon as a freshly cut piece of the metal is exposed to the atmosphere. This oxide coating is of great significance in the production of practically every type of superficial finish for the metal. It is, of course, the basis of what is probably the most corrosion resistant finish of all, namely, that group of finishes which involves the technique of anodic oxidation in its varied forms. Here, the natural film is, in effect, greatly thickened and strengthened electrochemically.

On the other hand, the tenacity of the natural oxide film is a serious adverse factor in the production of other finishes, such as those based on electrodeposition, and also the organic finishes, as it must be removed efficiently before the alternative coating can be applied successfully. Special techniques have had to be evolved to effect this, and much of the development work on metal finishing has been carried out only in recent years.

History of Light Metals

Aluminum and magnesium are strongly electronegative metals, and possess a strong affinity for oxygen; this is observed from the high heat of formation of their oxides. For this reason, although they are among the six most widely distributed metals on the surface of the earth, they were not isolated until well into the nineteenth century.

Alumina (Al_2O_3) and magnesia (MgO) were known, however, in the eighteenth century, and the first unsuccessful attempts to isolate the metals were made by Sir Humphrey Davy in 1807 and 1808 respectively, when the isolation of the alkali metals had made a powerful reducing agent available. It was not, however, until 1825 that the Danish worker, H. C. Oersted, succeeded in preparing aluminum powder by the reduction of anhydrous aluminum chloride with sodium amalgam; two years later, F. Wohler replaced the amalgam by potassium, and between 1827 and 1847 discovered and listed many of its chemical and physical properties. Meanwhile, the isolation of magnesium had been achieved in 1830 by Bussy, but many years passed before either of the two metals could be produced commercially.

The father of the light metal industry was probably the French scientist, Henri Sainte-Claire Deville, who in 1850 improved Wohler's method of preparation by replacing potassium by sodium, and by using the double chloride of sodium and aluminum as his source of the metal, thus making the production of aluminum a commercial proposition; the price, however, was still comparable with that of gold.

About this time, also, Johnson, Matthey & Co., began to produce magnesium in Manchester by the Deville method, and the production of both metals received a further impetus when Robert Bunsen and, following him, Deville, showed how the metals could be produced electrolytically from their ores.

In 1885 the brothers Cowle produced the first aluminum alloys containing iron and copper, soon after which, the invention of the dynamo made a cheaper supply of electricity available and resulted, in 1886, in Heroult's and Hall's independent French* and American† patents for the electrolytic production of aluminum from alumina and molten cryolite ($AlF_3 3NaF$). Thenceforth the production of aluminum in Europe centered round the first factory in Neuhausen, which is still the seat of the Aluminium-Industrie, A.G., while Hall's process was applied in the U.S.A. in Pittsburgh. Modern production of aluminum begins from the mineral bauxite, which contains approximately 25 per cent aluminum and, while magnesium is also produced from its ores, its production has centered recently round its extraction from sea water, the first major plant being opened in Freeport, Texas, by the Dow Chemical Co. in 1940.

The Advantages of Light Metals

The three main properties on which the application of aluminum and magnesium are based are their low density (S.G.: Al, 2.7; Mg, 1.8), the high mechanical strength achieved by suitable alloying and heat treatments, and the relatively high corrosion resistance of the pure metals. Other valuable properties include, their high thermal and electric conductance and reflectivity, their high ductility and resultant low working cost, their magnetic neutrality, high scrap-value,

*Fr. Patent No. 175,711.
†U. S. Patent No. 400,766 (1886).

and the non-poisonous and colorless nature of their corrosion products which facilitates their use in the chemical and food-processing industries. Still further valuable features are obtained by various treatments of the metals; these will be considered when the applications of the light metals and their finishes are considered.

In their pure state, aluminum and magnesium are, however, relatively soft metals and tend to self-anneal and lose strength. Pure aluminum has a yield strength of only 5,000 lbs. per sq. in. and a tensile strength of 13,000 lbs. per sq. in. It is only through the development of a wide range of alloys that light metals have achieved the manifold applications of today.

The light metals in their pure state have a relatively high corrosion resistance and need less protection than most heavy metals. On the other hand, the commercial metals and their alloys, though resistant, are distinctly more sensitive to corrosion, and the development of high strength light alloys, containing quantities of heavy metals such as copper, zinc or nickel, has heightened the need for protective surface treatments. The nature of the heavy metal additions appreciably influences the alloy's susceptibility to corrosion, and high mechanical strength and corrosion resistance have so far proved largely incompatible. The development of satisfactory protective finishes for these metals has been, therefore, of very great importance.

First, it may be desirable to consider briefly the properties of the various aluminum alloys which are available in relation both to their corrosion resistance and applications.

The Development of Aluminum Alloys

The chief alloying constituents added to aluminum are copper, magnesium, manganese, nickel, zinc and silicon. All of these are used to increase the strength of pure aluminum; this is achieved by the formation of intermetallic compounds which stiffen the soft matrix and reinforce the grain boundaries.

Two classes of alloys must be considered. The first are the "cast alloys" which are cast directly into their desired forms by one of three methods (i.e., sandcasting, gravity die casting or pressure die casting), while the second class, the "wrought alloys," are cast in billets and worked mechanically into extrusions, hot or cold rolled sheet or strip, forgings, extruded sections, bars for machining or forging, tubes of all shapes and sections, and wire.

The first cast alloys to be produced contained iron or nickel in order to improve the strength and chemical resistance, and silver to give ductility and luster to the aluminum. Iron alloys were found, however, to give unsound castings which lacked uniformity, while silver was too expensive and resulted in a slight improvement only. Aluminum-nickel alloys, which were later improved by the addition of copper, and the aluminum-magnesium alloys, which were light and possessed good corrosion resistance, were, therefore, the first alloys to be used commercially. In addition a rather heavy aluminum-zinc alloy (33.5 per cent. Zn) which was, nevertheless, very susceptible to corrosion, and an aluminum-copper alloy (Alloy No. 12) which was widely used in the U.S.A. up to the 1920's, were available.

Classification of Modern Alloys

Aluminum alloys can be classified according to their main constituents, which at the same time also influences their corrosion resistance, their casting properties and their physical and mechanical properties, and the extent to which these can be improved by heat treatments.

Pure and Commercial Grades of Aluminum:

Three commercial grades of aluminum are generally recognized, designated under the British Standards Specification Schedule B.S. 1470 by the names of 1A, 1B and 1C. In addition super purity aluminum sheet (99.99 per cent Al) is supplied. This has excellent corrosion resistance, especially under marine conditions, and is used almost exclusively for searchlight and other reflectors.

1A (99.8 per cent Al) sheet is used in chemical equipment, reflectors or applications where high ductility is required, e.g., components fabricated by impact extrusions.

1B (99.5 per cent Al) is available in bars, sheet or wire. It is used for the same applications as 1A except reflectors. Due to its substantially lower price, its use is to be preferred where possible. It also finds applications in electrical conductors, e.g., overhead transmission cables, etc.

1C (99 per cent Al) is also covered by the Specifications 3L16, 3L17, 2L34, L36, L54, and is available in the form of ingots, bars, tubes, sheet, wire and rivets. The wrought material is used for low strength applications, e.g., holloware, panelling, food containers, mouldings, etc., where high ductility is required. Cold working increases the strength at the expense of ductility. The alloy 2S also falls into this class.

The commercial grades of aluminum have good corrosion resistance compared with their alloys, but this decreases rapidly as the impurities increase. The maximum permitted content of the chief impurities of 1C are iron (0.7%), silicon (0.5%), copper (0.1%) and zinc (0.05%).

Alloys Containing Copper and Zinc:

Copper and zinc are useful hardeners for aluminum. Plain aluminum-zinc alloys are, however, very hot-short and therefore tend to crack in the mold. This fault may be corrected to some extent by the addition of copper.

For gravity die casting, a straight copper alloy is easier to handle and is improved by the addition of a little silicon. A 12 per cent copper alloy was, at one time, used for pistons, but it has now been replaced by more complex alloys, and has greater hardness though no increase in strength over the 8 per cent copper alloy. Wrought low copper alloys are used for highly stressed components, while certain Al-Cu-Zn-Mg alloys and Al-Cu-Zn-Si alloys are also employed for high strength. In wrought alloys the addition of copper seldom exceeds 4.5 per cent.

The alloys containing copper, zinc, or both, have poor corrosion resistance. They can often be heat treated to high strength but invariably need protection against corrosion, particularly in sea-water atmospheres. They are usually either anodized or painted for protection.

DURALUMIN:

Duralumin was the first heat-treatable alloy and was discovered by Alfred Wilm in 1906. When heat treated, the duralumin-type alloys develop tensile strengths of up to 60,000 lbs. per sq. in. and many alloys of this type are available, the most common containing approximately 4% Cu, 0.5% Mg, 0.7% Mn and 0.7% Si, while others contain no silicon and more magnesium. Their corrosion resistance is poor and the alloys are often coated with 99.5 per cent aluminum (Alclad) or an aluminum zinc alloy (Zn 0.5 to 1.5%) which improves corrosion resistance appreciably. The modern high-strength alloys contain slightly more magnesium and silicon and have tensile strengths of up to 70,000 lbs. per sq. in., even greater strength (up to 80,000 lbs. per sq. in.) being achieved by artificial ageing treatments. The alloys are generally anodized for protection against corrosion.

ALUMINUM-COPPER-MANGANESE-SILICON ALLOYS:

These are similar to the duralumin-type alloys in strength, though the wrought alloys are worked more easily and have poorer corrosion resistance.

ALUMINUM-COPPER-MAGNESIUM-ZINC ALLOYS:

These were developed during the war and, after heat treatment, alloys of this type achieve tensile strengths of well over 80,000 lbs. per sq. in. The best known examples of this type of alloy are the American alloys 75S and R303, which are artificially aged for maximum strength and ductility. Their corrosion resistance, however, is poor and the alloys are often used in the Alclad form.

ALUMINUM-COPPER-NICKEL-MAGNESIUM ALLOYS:

The aluminum-nickel alloys have high strength at high temperatures. The addition of copper makes the alloy heat-treatable while magnesium increases the hardness. The Al-Cu-Mg-Ni alloys are often used for pistons. Their corrosion resistance is poor and the alloys have complex compositions and cannot be cast easily. Many other piston alloys are now available, however; a heat-treatable 5 to 6% copper alloy, and a silicon alloy, which has a very low thermal expansion. Other piston alloys are available also, and are covered by various specifications.

ALUMINUM-MAGNESIUM ALLOYS:

The binary alloys are not heat-treatable, are lighter than aluminum, and possess excellent corrosion resistance, especially in marine atmospheres; they also possess good machining qualities. They are used where fairly high strength is required, e.g., intermediate between aluminum and heat-treatable alloys. (The 2 to 3 per cent Mg alloy, when annealed, has a tensile strength of 30,000 lbs. per sq. in). The alloy strain-hardens more easily than aluminum. Silicon is added to castings to prevent blow-hole formation on solidification, which causes pitting. The alloys show some of the chemical properties of magnesium in that they are more resistant than aluminum to alkalis and somewhat less so to acids; they also have excellent anodizing qualities.

A common addition to these alloys is manganese. The corrosion resistance of these alloys is slightly improved and they have good foundry properties and a high resistance to shock.

ALUMINUM-MAGNESIUM-SILICON ALLOYS:

These alloys are heat-treatable and though they are not as strong as the Al-Cu-Mg-Ni alloys or the duralumins, they have a greater elasticity and much better corrosion resistance. They have very good anodizing properties, but are not easy to cast, hence, like aluminum, they are readily formed and worked and have extensive applications in the dairy and brewery industries. Their tensile strength after heat treatment is as high as 45,000 lbs. per sq. in.

ALUMINUM-MANGANESE ALLOYS:

These alloys have a manganese content of between 1 and 2%, are not heat-treatable and are strengthened only by cold working. Their corrosion resistance is probably the highest of the aluminum alloys and they are used extensively for kitchen utensils, pipes, etc., where high corrosion resistance is combined with moderate strength. Alloy 3S has a tensile strength of 21,000 lbs. per sq. in. in the half-hard condition. A new development is the cladding of this alloy, which further improves its resistance to pit corrosion without sacrifice of workability. It was used during the war in this form for gasoline tanks in aircraft and light naval vessels.

ALUMINUM-SILICON ALLOYS:

These are chiefly casting alloys, containing between 10 and 13% silicon. Secondary additions are magnesium, manganese and copper. The casting alloys of high silicon content are often "modified," a process involving fluxing with molten sodium. This refines the grain structure and improves mechanical strength and ductility. The elastic limit of these alloys is, however, no greater than that of much weaker alloys and the alloys are generally soft and require great care in machining.

The corrosion resistance of the aluminum-silicon alloys is intermediate between that of aluminum and the high strength alloys and they are used to some extent in chemical equipment and for marine purposes, in which case they are generally painted. They can be anodized, but the oxide films are invariably of a greyish-yellow color, unattractive, and difficult to dye; hence, anodizing is for protection only.

The casting qualities are excellent as the alloys are very fluid in the liquid state and contract little on solidifying. The contraction takes place suddenly, however, and care must be taken to avoid large contraction cavities. The addition of magnesium to these alloys makes the alloys heat-treatable, and a considerable improvement in their strength is thus possible, with some improvement also in casting properties.

Where the expense of modification is unnecessary, less silicon may be used, and the 7 to 8 per cent silicon alloys are a little stronger than the aluminum-copper alloys, though they have a lower (0.1%) proof stress and hardness value.

ALUMINUM-SILICON-COPPER ALLOYS:

These alloys go some way towards combining the casting qualities of silicon and the stiffness of copper alloys. Their corrosion resistance is poor and they

are used for complicated sections and die-castings which require greater hardness and proof stress. A frequent addition is manganese and the alloys are often plated.

ALUMINUM-SILICON-MAGNESIUM-MANGANESE ALLOYS:

These alloys have all the good casting properties of silicon as well as exceptionally high elasticity and hardness, but they are only moderately ductile. The corrosion resistance is a little better than that of the aluminum-silicon-copper alloys.

OTHER ALLOYS:

It is unnecessary to consider in detail the numerous alloys that have been developed for special purposes. A noteworthy example of these is, however, their aluminum-tin alloys (6.5% Sn) which have found their application in bearings. These may also contain nickel and copper or, alternatively, may be backed with steel. They have found application in both the gasoline and diesel engines.

Recently developed is a new casting alloy containing copper, beryllium and cobalt, and claims for it include high mechanical strength, thermal stability and high resistance to oxidation.

Choice of Alloy and Finish

The choice of a metal for any particular application depends upon its mechanical, physical and chemical properties and also its price. While, however, the use of light metals as such must be limited to applications in which the higher cost is economically justified, as for example, where adequate strength must be combined with light weight and good corrosion resistance, the choice of a particular alloy is similarly determined by the mechanical properties required, the method of fabrication, and the conditions of service.

One of the most important limiting factors in the choice of a light metal or alloy is its corrosion resistance. As already indicated, both commercial grades of aluminum and their alloys sometimes need protection against corrosion. Numerous methods have been developed for this purpose and the ultimate choice depends generally on the following considerations:

(a) The service environment, i.e., indoor, outdoor or marine exposure, as well as liability to internal stress, etc.

(b) The basis metal, i.e., suitability of a finish to the particular alloy chosen.

(c) The decorative effects aimed at, e.g., color-anodizing, color systems in paint, reflectivity, etc.

(d) Special purposes, where additional features like hardness, abrasion resistance, insulation, etc., are required.

(e) The cost of the treatment.

The choice of a finish must to a large extent go hand in hand with the choice of the metal or alloy.

A general classification of protective and decorative finishes on aluminum and its alloys may be made as follows:

PROTECTIVE TREATMENTS AND FINISHES:

Metallic Protection (with Aluminum). Aluminum or aluminum alloy coating. Alclad or Aldural type clad alloys or sprayed aluminum coatings for mechanical and cathodic protection of wrought alloys.

Chemical Conversion Coatings. Application of thin oxide, phosphate or chromate films for light service conditions, or as base for organic finishes.

Anodic Oxidation. For more severe service conditions, or as a base for organic and electroplated coatings, protection for reflectors, and other specialized purposes due to the optical, thermal and electrical properties of films.

Organic Finishes. Paints, lacquers, resins, varnishes, etc., for maximum corrosion resistance may be applied on anodized or chemically treated surfaces.

Corrosion Inhibitors. Used as primers in painting and special applications in aluminum gasoline tanks, water coolers, etc.

Electroplating. Chrome plating for hardness and wear resistance, zinc plating for protection in, e.g., sea water, etc.

DECORATIVE TREATMENTS AND FINISHES:

Mechanical Finishes. Mechanical wheel-barrel-finishing, polishing, sand-blasting, scratch-brushing, for mirror-finishes, reflectors, satin finishes. Also hammered, fluted, embossed finishes, etc.

Chemical Treatments. Frosted, engraved, etched finishes, etc., by alkaline or acid immersion treatments.

Electroplating. For decorative purposes in indoor applications, but also on certain outdoor components, e.g., motor car die-castings, etc.

Anodic Oxidation. Color anodizing, protection for polished surfaces, etc.

Organic Finishes. For any desired color scheme in paint or enamel, etc. Also lacquers, varnishes, plastic and wood coatings.

Electropolishing and Chemical Polishing. For reflector work, or as a substitute for mechanical polishing.

Applications of Light Metals

The expansion of new industries is often greatest in time of war. As can be seen from Fig. 1, the annual world production of aluminum rose from 66,200 tons in 1913 to 165,000 tons in 1918, while the corresponding increase in the last war was from 500,000 tons to nearly 2,000,000 tons from 1938 to 1946.

In the last stages of the war and immediately after it, production figures of the light metals fell considerably, (though the decrease of corresponding consumption figures was not quite as pronounced). The aircraft industry, the chief market for the war applications, was reduced drastically, while the production of magnesium castings for incendiary bombs and other destructive purposes ceased almost completely.

As in all the metal finishing industries, the decorative finishing of the light metals ceased almost entirely during the war, the emphasis being entirely on protective treatments. Nevertheless, great strides were made, particularly in the fields of anodizing and electrolytic polishing, and improved corrosion protection, together with the high-strength alloys developed during the war have considerably widened the scope of the light metal alloys.

(Concluded on page 69)

A Radiometric Study of the Iron Phosphating Process[1]

By Stanley L. Eisler & Jodie Doss[2]

Abstract

THE amount of $FePO_4 \cdot 2H_2O$ contained in phosphate coatings prepared from solutions of H_3PO_4, NaH_2PO_4 and from a commercial iron phosphating preparation was determined radiometrically. By comparing these values with the total coating weights, determined gravimetrically, it was found in all cases the coatings consisted of less than 35% iron phosphate with the remainder probably gamma iron oxide. Treatment by immersion generally produced a higher percentage of iron phosphate in the coating than did the commercially recommended spray treatment.

Introduction

The use of phosphoric acid and alkaline phosphates for the treatment of steel or iron may be traced back to as early as 1880. In that year Kenerson[1] secured a patent for the use of microcosmic salt [$Na(NH_4)HPO_4 \cdot 4H_2O$] to treat steel prior to wire drawing. It is quite possible that the advantage gained as a result of the above treatment was due to the iron oxide-iron phosphate film formed.

In 1907, Coslett[2] obtained a patent covering the use of phosphoric acid and iron filings or powder to produce a coating on iron or steel to inhibit corrosion. This may be considered as the initial work on the use of iron phosphate coatings for corrosion prevention. All other methods, many of which may be found in the patent literature, are modifications of or improvements on this original patent.

Recently, the use of iron phosphate coatings has been strongly recommended as a substitute for zinc and manganese phosphate coatings as an undercoating for phenolic and resin varnishes requiring high baking temperatures as well as for other applications. This investigation was undertaken to determine if comparable corrosion resistance was afforded by the iron phosphate coatings. The criterion selected for the comparison was the weight of metallic phosphate per unit area. Since the amount of iron phosphate produced in a relatively short treatment time (as recommended by the suppliers of the various solutions) is very minute, the use of radioactive tracer techniques was considered essential.

Pryor and Cohen[3] after a very exhaustive study of the corrosion of iron by solutions of sodium orthophosphate concluded that oxygen dissolved in solution is mainly responsible for the ability of phosphate solutions to inhibit the corrosion of iron. Their theory is that the dissolved oxygen takes part in a heterogeneous reaction with surface iron atoms to form a film of gamma Fe_2O_3. In a later article Pryor, Cohen and Brown[4] have concluded that initial electrochemical attack at discontinuities in the oxide film results in the formation of relatively thick plugs of $FePO_4 \cdot 2H_2O$.

Based on the results of the above investigators it was considered essential to determine if similar reactions occurred when solutions of lower pH were employed. The lower pH solutions are representative of present commercial

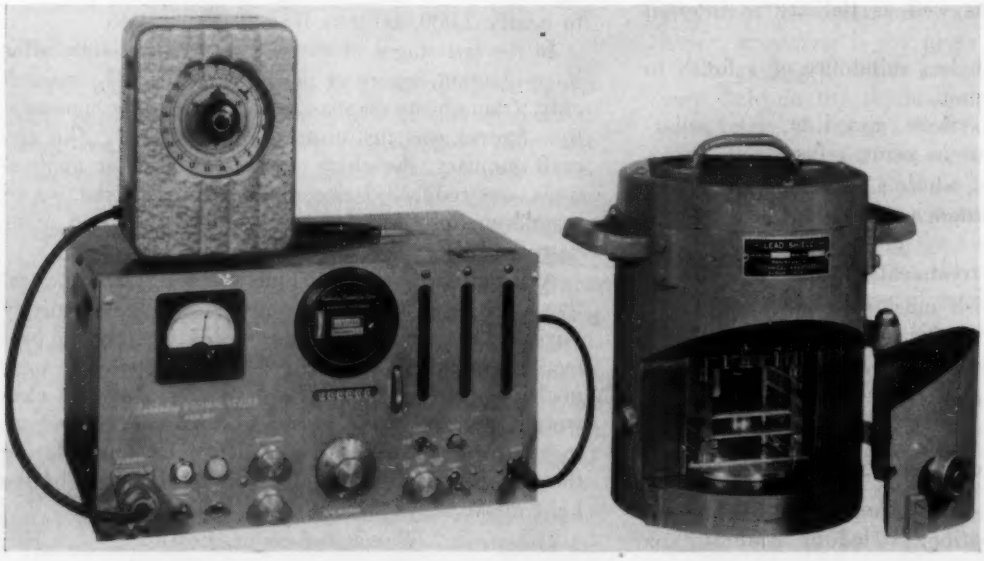

Figure 1. Special counting setup for phosphated panels.

(1) The opinions or assertions contained herein are not to be construed as being official or reflecting the views of the Department of the Army.

(2) Supervisor of Radiochemistry Section and Chemist, respectively, Ordnance Corps, Rock Island Arsenal, Rock Island, Illinois.

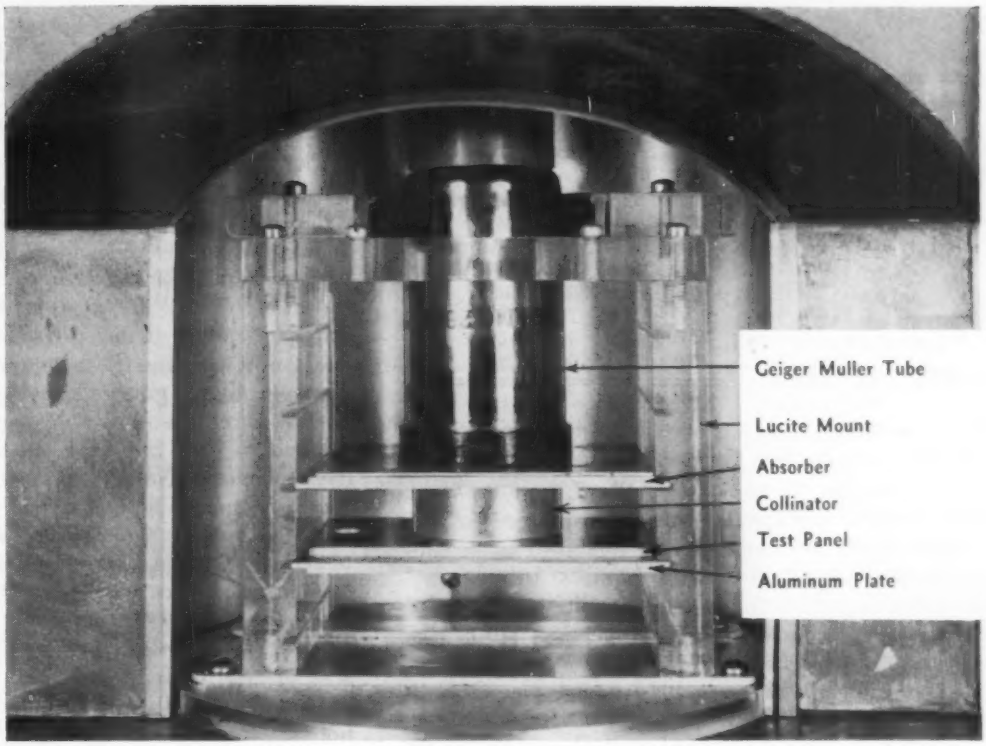

Figure 2. Close-up of interior of lead shield showing absorber arrangement.

products. If it could be shown that the action is similar and that the passivity is provided principally by the oxide film which Pryor and Cohen state requires 24 hours to produce, then the recommended commercial treatments of one to five minutes duration would appear to be entirely inadequate.

Materials Employed

The steel test panels used were made of S.A.E. 1020 steel and were 2" x 3" x $\frac{1}{16}$" in size with a $\frac{5}{16}$" hole centered $\frac{1}{4}$" from one end for ease in handling. The panels were surface ground to provide a smooth surface and then degreased in trichlorethylene vapor and electrolytically cleaned in an alkaline bath to remove any remaining oil residues or oxide films. The panels were then rinsed in running tap water to remove all alkaline residues. Finally, the panels were rinsed in alcohol, air blown until dry and desiccated until needed.

The radiophosphorus used in this investigation was procured from the Oak Ridge National Laboratory by authorization of the Atomic Energy Commission, Isotopes Division, and was received in the form of $H_3P^{32}O_4$.

Three different phosphating solutions were employed for the test containing either H_3PO_4, NaH_2PO_4 or Compound A, a commercial product. Six liter volumes were made up for the spraying tests and one liter volumes for the immersion tests. Different concentrations were used for the two methods of applying the coating. These concentrations were as follows:

Material	*Spraying Solution*	*Immersion Solution*
H_3PO_4 (85%)	1.9 g./l.	1.9 g./l.
$NaH_2PO_4 \cdot 2H_2O$	15.0 g./l.	7.5 g./l.
Compound A	15.0 g./l.	22.5 g./l.

The radiophosphorus in the form of $H_3P^{32}O_4$ was added to each of the above solutions to give an activity level of approximately 0.5 microcurie per milliliter.

Controls were prepared from steel coupons 0.975" in diameter and $\frac{1}{16}$" thick. After the coupons were degreased and cleaned by the procedure outlined above, a 0.5 ml. aliquot of a 1-10 diluted volume of each of the test solutions was pipetted onto each of a series of five coupons. The coupons were then dried under an infra-red lamp while mounted on a sample spinner revolving at a speed of 20 r.p.m. Periodically the spinner was tilted to facilitate the flow of the solution over the face of the coupon.

Test Procedure

The two methods employed to phosphate the steel panels were as follows: (1) by spraying the phosphating solution on the surface of the panels or (2) by the immersion of the panels in the phosphating solution. A portable laboratory spray unit was employed for the spraying of the panels. The spray unit, when operated at a pressure of 12 psi, delivered twenty gallons per minute from 24 solid cone nozzles which were approximately seven inches from and perpendicular to the face of the panels. The unit was thermostatically controlled and a temperature of 160°F. was maintained. For the immersion tests, the panels were phosphated

Table 1

Counting Determinations of Controls

Solution	*Net Counts per Minute*	*Specific Activity (c/m/mg. of PO_4)*
Series A Tests		
H_3PO_4	3723	47548
NaH_2PO_4	4974	9640
Compound A	5236	9787
Series B Tests		
H_3PO_4	5280	67483
NaH_2PO_4	4917	9529
Compound A	4798	8968
Series C Tests		
H_3PO_4	5850	74713
NaH_2PO_4	5900	22868
Compound A	6000	7477

Table 2

Coating Weights

(Mg. per sq. ft.)

Solution	Treatment Time	Test A-2	Test B-1	Test B-2	Test C-1	Test C-2	Test C-3
H_3PO_4	1 min.	57.6	38.4	108.0	56.4	19.2	86.4
"	3 "	114.0	96.0	99.6	26.4	14.4	82.8
"	5 "	118.8	90.0	104.4	60.0	19.2	82.8
NaH_2PO_4	1 "	88.8	27.6	142.8	61.2	8.4	78.0
"	3 "	88.8	73.6	272.4	63.6	15.6	78.0
"	5 "	120.0	93.6	309.6	88.8	18.0	85.2
Compound A	1 "	180.0	12.0	111.6	73.2	100.8	60.0
"	3 "	126.0	48.0	97.2	58.8	62.4	64.8
"	5 "	242.4	40.8	271.2	56.4	136.8	109.2

by simple immersion in a one liter volume of the test solution maintained at a temperature of 160°F.

After cleaning, as previously outlined, the test panels were weighed and then phosphated using one or the other methods of treatment. The treatment times employed were one, three and five minutes. In all cases, five panels were used for each test condition to improve the statistical accuracy. After phosphating, the panels were thoroughly rinsed in running water, rinsed in ethyl alcohol, air blown until dry and placed in a desiccator. The panels were then reweighed and the counting rates were determined using the procedure to be presented in a later section. The phosphate coating was then removed by electrolytic stripping as described in a prior report.[5] The panels were weighed a third time after rinsing and drying and the coating weights determined as the difference between the second and third weight determinations.

Counting Procedure

The panels were counted by placing them on an aluminum plate held in a Lucite mount and the entire assembly was located in a 1½" lead shield to provide shielding from cosmic radiation (see Figure 1). In order to provide the same geometry for counting the circular coupons and the larger test panels, an aluminum absorber, 0.188" thick and having an opening 0.975" in diameter was used. This absorber prevented practically all radioactive particles emanating from the panel beyond the 0.975" diameter area from reaching the effective counting area of the counter tube (see Figure 2). By employing this absorber for both control coupons and test panels it was possible to translate relative counting rates into relative amounts of phosphate on the test panels. The panels were approximately 15 mm. from the window of a TGC-2 Geiger Muller Counter tube which was operated in conjunction with a Berkeley #2000 Scaling Unit. All counting determinations were made for five minutes.

Table 3

Counting Rates of Test Panels

Counts per Minute

Solution	Treatment Time	Test A-2	Test B-1	Test B-2	Test C-1	Test C-2	Test C-3
H_3PO_4	1 min.	1794	1155	595	831	587	942
"	3 "	2227	4342	387	2189	634	1063
"	5 "	1305	3963	46	2633	478	978
NaH_2PO_4	1 "	661	320	412	728	386	637
"	3 "	713	632	764	681	503	903
"	5 "	645	1586	1446	1011	513	812
Compound A	1 "	781	165	229	250	277	191
"	3 "	975	334	195	257	307	315
"	5 "	1022	514	1116	258	438	311

Test Results

The counting rates of the control coupons and the specific activities calculated therefrom are tabulated in Table 1. Although all solutions were made up to have approximately the same level of activity, 0.5 microcurie per milliliter, the discrepancies in counting rates shown in the table are, in part, attributable to the time elapsed between initial preparation of the solutions and the preparation of the control coupons. Coupons prepared after a greater elapsed time would naturally have a lower counting rate due to the decay of the radiophosphorus. Since the half life of P^{32} is only 14.3 days the effect of a few days variance in elapsed time would be appreciable. However, these values were all normalized by correcting all subsequent counting rates to zero time, taken as the time of counting the control coupons. The value for the H_3PO_4 solution in Series A is also much lower due to the fact that this solution had been used for several preliminary tests prior to the start of Test A-2.

It may also be noted that the specific activities do not vary in accordance with the counting rates. This is due to the differences in solution concentrations between the Series A and B solutions prepared to be used for spraying tests and the Series C solutions prepared for immersion tests.

Table 4

Weight of $FePO_4 \cdot 2H_2O$ in Coating

Milligrams/Square Foot

Solution	Treatment Time	Test A-2	Test B-1	Test B-2	Test C-1	Test C-2	Test C-3
H_3PO_4	1 min.	14.1	6.5	3.3	4.2	3.0	4.8
"	3 "	17.7	24.3	2.1	11.0	3.0	5.4
"	5 "	10.4	22.2	0.3	13.2	2.3	5.0
NaH_2PO_4	1 "	26.0	12.7	16.3	12.1	6.4	10.5
"	3 "	27.9	25.1	30.3	11.3	8.3	14.9
"	5 "	25.3	62.9	57.3	16.6	8.3	13.4
Compound A	1 "	30.2	6.9	9.6	12.5	14.0	9.6
"	3 "	37.5	14.1	8.2	12.8	15.5	15.9
"	5 "	39.4	21.7	47.0	12.8	22.3	11.8

It should also be mentioned that some errors are introduced by the fact that it was not possible to prepare the control coupons with an overall uniform film. During the drying period there was a tendency for the liquid to be pulled to the outer edge of the coupon face and a heavier deposit resulted there. The previously detailed control coupon preparation procedure was designed to eliminate this condition but was only partially successful.

The specific activity of each solution, as counts per minute per milligram of PO_4^{-3} was calculated by dividing the average net counts per minute of the control coupons by the weight of PO_4^{-3} contained in the 0.5 ml. aliquot pipetted on the coupon.

The results of the three spraying tests (Tests A-2, B-1 & B-2) and the three immersion tests (Tests C-1, C-2 & C-3) conducted are presented in Tables 2 to 5 inclusive. The coating weights and counting rates presented in Tables 2 and 3 were obtained by the procedures previously detailed. The weight of $FePO_4 \cdot 2H_2O$,

Table 5

Percentage of $FePo_4 2H_2O$ in Coating

Solution	Treatment Time	Test A-2	Test B-1	Test B-2	Avg. for Spraying Tests	Test C-1	Test C-2	Test C-3	Avg. for Immersion Tests
H_3PO_4	1 minute	24.4	16.9	3.0	14.8	7.4	15.6	5.6	9.5
"	3 "	2.8	25.3	2.1	10.1	41.6	20.8	6.5	23.0
"	5 "	8.8	24.6	0.2	11.2	22.0	12.0	6.0	13.3
NaH_2PO_4	1 minute	29.2	46.0	11.4	28.9	19.8	76.2	13.4	36.5
"	3 "	31.4	34.2	11.1	25.6	17.8	58.3	19.1	31.7
"	5 "	21.0	67.2	18.5	35.6	18.6	46.1	15.7	26.8
Compound A	1 minute	16.8	57.5	8.6	27.6	17.0	13.8	16.0	15.6
"	3 "	29.8	29.4	8.4	22.5	21.8	24.8	24.5	23.7
"	5 "	16.2	53.2	17.3	28.9	22.6	16.3	10.8	16.6

in the coating expressed as mg./ft.^{2}, as given in Table 4 was calculated as follows:

$$\frac{\text{Average counting rate of panels}}{\text{Specific activity of solution}} = \text{mg. of } PO_4^{-3} \text{ on equivalent area}$$

$$\text{mg. of } PO_4^{-3} \text{ on equivalent area} \times 192 = \text{mg. } PO_4^{-3}/\text{sq. ft.}$$

$$\text{mg. } PO_4^{-3}/\text{sq. ft.} \times 1.97 = \text{mg. } FePO_4 \cdot 2H_2O/\text{sq. ft.}$$

The percentages of $FePO_4 \cdot 2H_2O$ in the coating given in Table 5 were obtained by dividing the values presented in Table 4 by the coating weights per sq. ft. given in Table 2. The average values for the three spray tests and the three immersion tests are also presented.

The following salient points may be noted from the data presented in Table 5.

1. There is a wide variation in the percentage of $FePO_4$ in the coating between similarly conducted tests. This is particularly true in the group of spray tests. This may be due to variations of the amount of dissolved air in the solution as Pryor and Cohn[3] claim a solution saturated with oxygen produces the maximum amount of gamma Fe_2O_3 in the coating.

2. There was generally a higher percentage of $FePO_4$ in the coatings produced by immersion than in the coatings produced by spraying when H_3PO_4 and NaH_2PO_4 solutions were used. However, the opposite was true in the case of Compound A. It would be expected that the spraying operation, due to the larger amount of air dissolved in solution, would produce a coating with more Fe_2O_3 and less $FePO_4$. The reversal of this fact in the case of Compound A may be attributed to the presence of an acid inhibitor added to accelerate the production of $FePO_4$ in the coating during the relatively short spraying operation recommended by the manufacturer.

3. The most significant fact is that the average values in no case exceeded a value of 36.5% $FePO_4$. This would seem to indicate that the designation of the coating as an iron phosphate coating is incorrect.

4. No relationship between exposure time and the amount of $FePO_4$ in the coating could be established on the basis of the data presented.

5. The close agreement between the results of the spraying tests using NaH_2PO_4 and Compound A would seem to indicate that NaH_2PO_4 is the principal ingredient of the commercial product. However, it is to be noted that only about one half as much $FePO_4$ is contained in the coating produced by immersion in Compound A, further indicating that this compound is prepared primarily to be used in a spray operation.

6. The extreme inconsistencies noted in the data indicate that the coatings produced are heterogeneous and definite predictions concerning their corrosion resistance cannot be made from test to test or batch to batch in production.

Based on the results contained in this report it may be concluded that corrosion resistance is not provided as there is not a true iron phosphate coating over the entire surface. Similarly, a dense protective iron oxide coating is not produced, as all references in the literature state that several hours are required for this type of coating to be formed. Therefore, it may be expected that the amount of corrosion protection would be less than that provided by zinc or manganese phosphate coatings which are heavier and more homogeneous.

Therefore, the original application recommended for the iron phosphate coatings i.e., as an undercoating for phenolic and resin varnishes requiring high baking temperatures, appears to be the only application worthy of consideration. The advantage for the iron phosphate coating in this application is probably attributable to the fact that it loses its water of crystallization less readily than either the zinc or manganese phosphate coatings during the baking operation thus reducing the possibility of blistering under the varnish film.

It is suggested that, in all cases except that mentioned above where corrosion resistance is of primary consideration, that iron phosphate coatings should not be used to replace either zinc or manganese phosphate coatings.

The authors wish to express their appreciation to their co-workers at the Rock Island Arsenal Laboratory for their assistance and to the Ordnance Corps, Research and Development Division, Department of the Army and the Supervisory Staff of the Laboratory for permission to publish the information in this paper.

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Electroless Nickel Barrel Plating

By Harry J. West, *Elkhart, Ind.*

THIS article presents the results obtained with electroless barrel nickel plating in actual commercial production, explaining and outlining the exact procedure, type of equipment and formula actually in use. Electroless nickel barrel plating, as far as the author knows, has not been used successfully until now. The reason for this was the type of material used in the manufacture of the barrel itself, the temperature maintained and the lining used inside the plating tank.

The barrel composition must be of a non metallic material and must not be rubber covered metal of any type. It has been found that a portable plating barrel unit with cylinder size 6″ x 12″ made of polystyrene is fine. This type of material is easily damaged because of its brittleness but careful handling will overcome most defects which might occur. High temperature Lucite was found to be a satisfactory material from which to construct an electroless nickel plating barrel. Of course no electrodes are needed so if the barrel comes equipped with contacts they can be easily removed. Either plastic is satisfactory.

The tank found to be ideal for this type of plating is a porcelain lined steel tank of dimensions 17″ deep x 24″ wide x 45″ long, with drain, and steam heated with graphite coil. When first experimenting with barrel plating live steam was employed and a very beautiful deposit was obtained. However, the same results might be an impossibility in other plants, due to condition of steam, etc. Since the temperature should be maintained at 185°F. a controller is almost a necessity. The abovementioned tank will accommodate two 6″ x 12″ portable plating barrels very nicely and, since the solution must be thrown away at end of each work day, will not hold enough excess solution to be wasteful. A plain steel rod supports the two barrels.

The advantage of barrel plating electroless nickel over rack plating is the fact that in the tumbling operation of the plating barrel new solution is allowed to enter any blind or deep holes and, therefore, allows these holes to be plated with sufficient thickness to meet most specifications. Then again, the tumbling effect gives a brighter plate than still plating. This type electroless nickel plating is not difficult and, with any care at all, the average plater should have no trouble. If the parts are thoroughly cleaned and not allowed to oxidize or rust to any degree, the deposit will look very good. Again, proper rinsing after plating is a must but not to be overdone as parts should be dried immediately.

Operating Procedure

The formula to be used for electroless nickel barrel plating is as follows for a tank holding 80 gallons described above:

800 fl oz. of 5 lb./gal. solution of nickel chloride.
100 oz. sodium citrate
100 oz. sodium hypophosphite

These chemicals are added, one at a time, when the temperature of the water has reached 175°F., making sure all chemicals are dissolved before starting the plating operation. The operating temperature is 185°F. and plating time for barrels is 30 minutes. This will give approximately 0.00015″ deposit thickness. The pH of the solution should be maintained at 4.0 but lower pH's have worked satisfactorily. To maintain the pH the addition of a solution of 2 oz./gal. of a 20% solution of caustic soda, is required dropping into the plating solution during operation only, at the rate of about 30 drops per minute. The caustic must be thoroughly dissolved.

Many failures in electroless nickel are due to not following the exact procedure and the above procedure has been proven. The chemicals used should be of high purity and the nickel chloride should be filtered before using. If anything but C. P. grade is used, filtering through a paper-interlined anode bag is recommended. Good degreasing and electrocleaning is a must since the slightest amount of grease or oil will show black spots on plating surface. However, replating can be done successfully but, so far, only by racking the parts. We have seen parts replated as many as four different times without blistering or peeling.

The proper procedure for drying parts after the plating operation should be followed, as electroless nickel is actually an alloy of nickel and phosphorus (approximately 99% nickel — 1% phosphorus). Discoloration will show if parts are not dried immediately after plating and our method is to rinse about 1 minute in cold water, rinse thoroughly in denatured alcohol, centrifuge, dip in oil, and recentrifuge.

We have found it necessary to add sodium hypophosphite after four hours of operation to keep the parts bright. The abovementioned formula requires the addition of 24 oz. of hypophosphite after four hours operation.

The solution is discarded after each day's run (8 hours) and a new solution made the next day. The nickel chloride, of course, can be dissolved and filtered ahead but the plating solution itself cannot be prepared ahead because it will decompose.

Wooden barrels of various kinds have been tried without much success, due to the resins which are extracted from the wood at the high plating temperature. There are probably woods which would be satisfactory but this writer hasn't located and tried them as yet.

Exterior view of new plant of Modern Plating Company, Los Angeles, costing $1,000,000 for building and equipment and regarded as the largest complete metal finishing and parts fabrication plant on the Pacific Coast.

Million Dollar Job Shop in Full Operation

By Fred A. Herr, *Pacific Coast Editor*

AFTER more than six years of planning and construction, *Modern Plating Co.* of Los Angeles is now in full operation in its new million dollar metal finishing plant at 5400 West 104th St., in the industrial district adjacent to the Los Angeles International Airport.

Four years of preliminary planning preceded the start of construction in June, 1950, and the building was completed in May, 1951, at which time the installation of new equipment and transfer of existing machinery and tanks from the company's plant at 308 East Regent St., Inglewood, was begun.

Due to the heavy demands of the defense program, it was imperative that this move should not effect the company's productive ability. By establishing a closely coordinated equipment transfer plan, the firm was able to complete its move early in 1953 without interrupting production. As a matter of fact, it was revealed to METAL FINISHING that, during the two-year transfer period, production actually increased by more than 50%.

The new facility is considered the largest complete metal finishing plant on the Pacific Coast. The plant and equipment valued at over $1,000,000 was designed and constructed on the basic engineering tenet of providing a completely diversified metal finishing facility of high productive capacity which was versatile enough in layout to meet the varied processing requirements of the job finishing business. In order to carry out this engineering policy, all equipment design, layout, construction and installation were performed by company personnel.

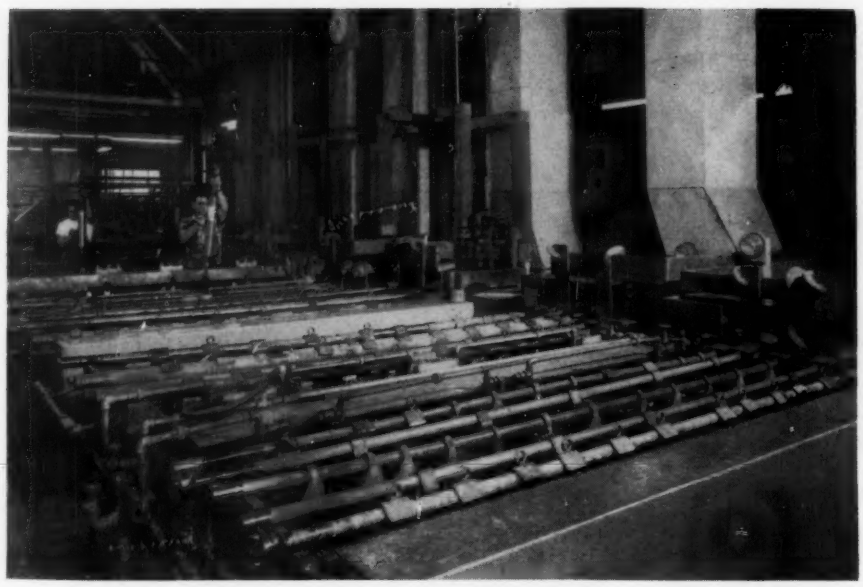
Leo Atimion, founder and owner of the firm, started in the metal finishing business in 1923 as manager of Standard Nickel Chromium Plating Co. of Los Angeles. He served in that capacity until 1934, at which time he formed Modern Plating Company in Inglewood. During its 19 year history, the firm has grown steadily to its present stature due to his careful and competent management.

The new company-owned building is located on a plot of land with 115,000 square feet of area. The plant has 30,000 square feet of production space, the balance of the land being devoted to uncovered storage areas and parking space. The one story building is constructed of reinforced concrete with a double Summer-Bell type truss roof. The plant is 120 feet wide by 220 feet long, plus an attached shipping-receiving building and dock 90 feet long by 35 feet wide.

The administrative area includes reception and switchboard facilities, and the following offices: owner, office manager, accounting, sales, production control, superintendent, shipping and chemical laboratory.

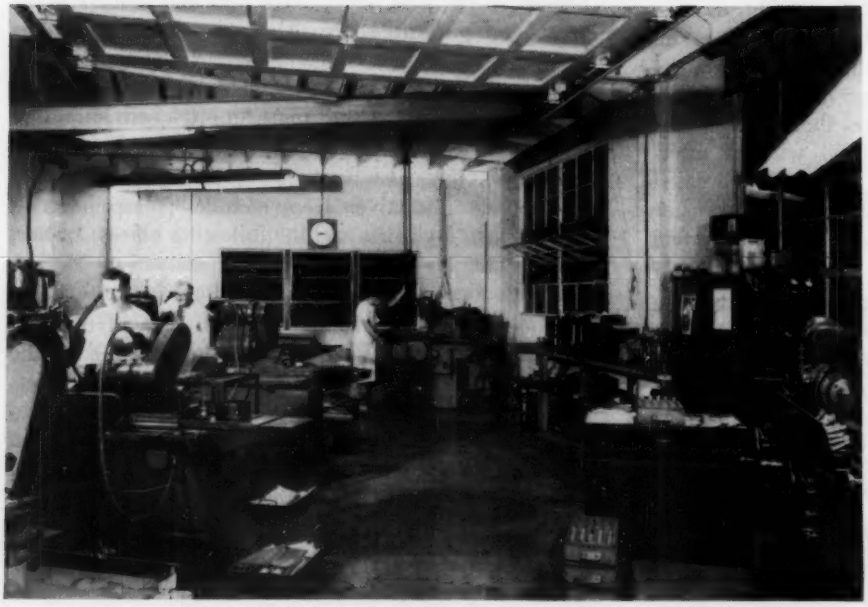
Modern Plating chromium plated some of the first aircraft hydraulic pistons manufactured in the middle 1930's and its pioneer position in this activity has been firmly entrenched by constant contribution to the engineering design and production techniques on this type of actuating mechanism since that time. Because of the precision nature of this equipment, it is imperative that precision grinding, chromium plating and finish grinding be closely coordinated.

In a majority of cases such coordination was not



A view of the hard chromium plating line. This department of the new plant is equipped with ten tanks having a capacity of 16,000 gallons of chromium solution.

The buffing and polishing department alone occupies an area measuring 50x60 feet. It is equipped with 13 standard polishing lathes, four belt polishing machines, three centerless tube polishing machines, and three semi-automatic polishing units.



Precision grinding department.

The barrel plating department is equipped with bulk deburring and burnishing machines with capacities from 1 lb. to 1000 lbs. and with vapor blast facilities.

The plating operations are served by two complete cleaning lines. Some of the 15 tanks in the double cleaning line is shown here. A twin-hook, fluid-drive crane serves the cleaning tanks.

A number of the tanks in the general plating dept. is shown (left) in this photo, with the edge of the cleaning line visible on the right. There are ten plating solutions in the general plating department, in which plating operations are carried on in both still and semi-automatic tanks.

Part being buffed in the polishing department.

possible when separate plants performed the grinding and plating operations. The company therefore installed a precision grinding department in the new plant, which today is an important part of its production operations. The plant contains a precision cylindrical grinding room and a precision centerless grinding room, each about 25x30 feet in area. Those departments are equipped with the following machinery: Three precision centerless grinders capable of .0002" tolerance on parts varying in size from $\frac{1}{16}$" by $\frac{1}{8}$" to parts 4" in diameter to 10 feet long; seven cylindrical grinders including a 12"x48", a 10"x24", a 12"x36", a 6"x18", a 10"x30", a 10"x48", and a 24"x144". Such equipment is not usually found in a plating shop and has enabled the company to do a complete finishing job on aircraft hydraulic parts.

On many hydraulic parts finishing represents 60% or more of the total manufacturing cost. As a result, Modern Plating has been requested by many hydraulic manufacturers to build complete parts and this is being carried out on a substantial scale where preliminary machining, flash-welding and heat-treating operations are sub-contracted to other concerns, and the part is then finished by the company.

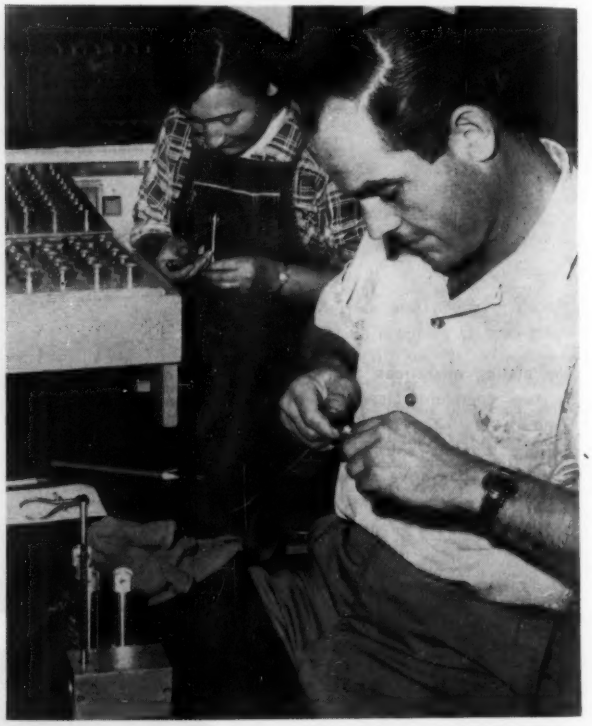
The manufacturing and finishing of aircraft hydraulic parts must be done to exacting standards and, to insure consistent high quality, a precision inspection department was installed in the new plant. This department is completely equipped with precision inspection tools and performs 100% final inspection on all hydraulic parts to make sure they meet dimensional and finish requirements. Many of these parts require several inspections during the processing sequence.

Supplementing the inspection department in quality control is a completely equipped chemical laboratory which maintains all plating solutions by analysis and performs plating tests to rigid standards. The laboratory also performs special chemical tests on parts or finishes where required, and does process development work. All production departments are supplied with inspection tools so that quality can be maintained during processing.

In order to coordinate plant production and outside production with customer delivery requirements, a production control department is maintained and its operation, together with the sales department and outside purchasing department, is under unified supervision.

Polishing, buffing and plating operations are conducted in a 120x170 foot area. This production space is supplemented by the grinding, soldering, chemical analysis and production control areas which occupy individual areas along the rim of the main production area.

The buffing and polishing department occupies a 50x60 foot area in the northeast corner of the shop. This department operates with thirteen standard polishing lathes as well as four belt polishing machines,



The Inspection Department is equipped with precision inspection tools to make 100% final inspection on all hydraulic parts for dimensional and finish requirements.

three centerless tube polishing machines, and three semi-automatic polishing machines.

The general plating department measures some 110x120 feet. It is divided into sections for general job plating, hard chromium finishing, barrel plating and decorative painting. The general plating department is equipped to plate gold, silver, tin, copper, hard nickel, bright nickel, cadmium, zinc, decorative chromium, chromic acid anodizing, and facilities for varied chemical treatments for ferrous, non-ferrous and plated metals.

The plating operations are carried out in both still and semi-automatic tanks, and are served by two complete cleaning lines consisting of fifteen tanks

seven feet long and varying in width from 1½ feet to 3 feet, and in depth from four feet to seven feet, placed side by side. The work to be cleaned is carried on a traveling rod seven feet long, which is moved through the cleaning sequence by a twin-hook fluid-drive crane. This setup makes it possible to clean work in large volume and at the same time vary the cleaning cycle on various types of work.

Hard chromium plating equipment is concentrated in a 55x60 foot area of the shop, west of but adjacent to the general plating line. This department operates with seven tanks, 9 ft. long by 3 feet wide by 8 feet deep; two tanks 9 feet long by 3 feet wide by 4½ feet deep; and one tank 7½ feet long by 2½ feet wide by 20½ feet deep. This provides a total of 16,000 gallons of chromium plating solution with 60,000 amperes of connected D.C. power utilizing both rectifiers and generators. The chromium tanks are served by special hoists and cranes including a 25 foot vertical lift six-ton crane over the 20½ foot deep tank.

The barrel plating department operates with four bulk deburring and burnishing machines with capacities from 1 lb. to 1000 lbs. This department is also equipped with vapor blast facilities.

The new plant also contains a decorative plating department for copper, nickel and chromium on steel and nonferrous metals; a painting department for zinc chromate primer and clear lacquer, and three baking ovens for paint and enamel baking, as well as post-machining stress relief and post-plating hydrogen embrittlement relief.

All plating equipment in the new plant is located in pits which are from 1½ to 18 feet below the floor level. Tank height above floor level has been carefully controlled to provide safe, efficient working conditions. All walkways around tanks are at floor level and consist of iron grills which provide safe, non-skid surfaces. All equipment is under master control by the maintenance department to insure maximum safety and peak efficiency. Safety and first aid programs and committees have been established to provide maximum employee protection.

Electrical power for the plant is supplied by 34,500 volt primary lines to a transformer station located on plant property, serving a 440 volt, 3,000 ampere master panel. Each piece of equipment or groups of equipment are served by subpanels which are fed by the master panel and contain all necessary push button starters, magnetic switches, and electrical interlock devices essential to safe and dependable operation. Each piece of electrical equipment is connected to lights on the sub-panel which indicate which equipment is operating. Each leg of the three phase power is connected to indicating lights in the maintenance department which show immediately any ground or unbalance in the electrical system. All electrical equipment was designed and installed by the company's own electrical department.

Close-up view of one of the cleaning tanks with hoist.

Shipping and receiving operations are conducted in a 30x90 foot dock which projects from the western side of the main building. This department is spacious and well defined in order to efficiently receive, count and store customers' merchandise. Upon receipt of parts, a job processing card listing each operation in proper sequence is written on each job. A copy of this card goes to the production control office.

The facilities of the new plant are geared to handle the fabrication and metal finishing on parts ranging in weight from one ounce to six tons; from a small rivet to a hydraulic ram two feet in diameter and 18 feet long.

TREATMENT AND FINISHING LIGHT METALS

(*Concluded from page* 59)

It is not within the present scope to consider the applications of the light metals in any detail. However, as early as 1859, H. Sainte-Claire Deville envisaged the use of aluminum, among other applications for sextants and for the field glasses and telescopes carried to war by officers. Modern war has found more lethal uses for the light metals, and the rise in world production figures during the two world wars is grim testimony to their value under the most rigorous service conditions.

Pure aluminum has restricted applications, though its use in unstressed, highly corrosion resistant components is still extremely large. There are some specialized applications, notably its use for reflectors, which will be dealt with in detail when polishing methods are discussed. An important new development is, however, the use of 99.5 per cent aluminum sheet for the canning industry, where it has, to some extent, replaced tinplate, especially in France and Switzerland. For neutral foodstuffs its appearance, lightness, and relatively high strength are ideal, and, when anodized, it has been used even with acid foodstuffs, unsweetened condensed milk, etc. Pure aluminum is also still the easiest basic material both for anodizing and in electrolytic polishing and a very high purity aluminum is presently finding wide application in jewelry, usually anodized and gold dyed.

To facilitate a better understanding of the theory and applications of the various protective treatments applied to aluminum and its alloys, the next article will be devoted to a discussion of the corrosion and protection of aluminum and its alloys.

Emulsifiable Solvent Cleaning

By B. J. Sherwood, *General Manager, Chemplate Co., Los Angeles, Cal.*

The author majored in Chemical Engineering at the Virginia Polytechnic Institute, and has a Master of Science degree from the University of Southern California. His experience includes research and development work on guided missles, and technical representation work on cleaning and specialized finishing problems. He is currently engaged in setting up the Chemplate Co., devoted to chemical plating processes. —*Ed.*

EMULSIFIABLE solvent cleaning is one of the best tools available to the workshops of the metal finishing industry for use in the pre-cleaning operation of the plating cycle. Unfortunately, industry-wide acceptance of this method has been retarded by the lack of knowledge relating to the operating characteristics and technical advantages of the process. It is the purpose of this article to provide this type of information.

The Need for Pre-Cleaning

Before proceeding to the discussion of a specific pre-cleaner, it would appear that a brief review of the need for pre-cleaning would be advantageous. Pre-cleaning conventionally refers to the operation in which heavy soils such as buffing compounds, solid dirt, rust preventives, lubricants, and forming compounds are removed prior to treatment in an alkaline soak or alkaline electrocleaner. (See Fig.) Should this operation be omitted from the cleaning cycle on heavily contaminated parts, the alkaline cleaning tanks would rapidly become grossly contaminated and consequently be rendered ineffective. In addition, the overall cleaning time would be greatly lengthened as a result of the inability of the alkaline materials to rapidly remove heavy soils. An additional byproduct of omission of the pre-cleaning step, in certain cases, might be the complete inability of the alkaline cleaner tanks to remove certain soils regardless of the time expended, due to the inherent physical properties of alkaline cleaners. It must be emphasized that a pre-cleaner must be followed by a final alkaline treatment in order to remove the last vestiges of soil and thus obtain a physically clean surface suitable for plating.

Types of Pre-Cleaners

Basically there are five types of pre-cleaners available, which are as follows:

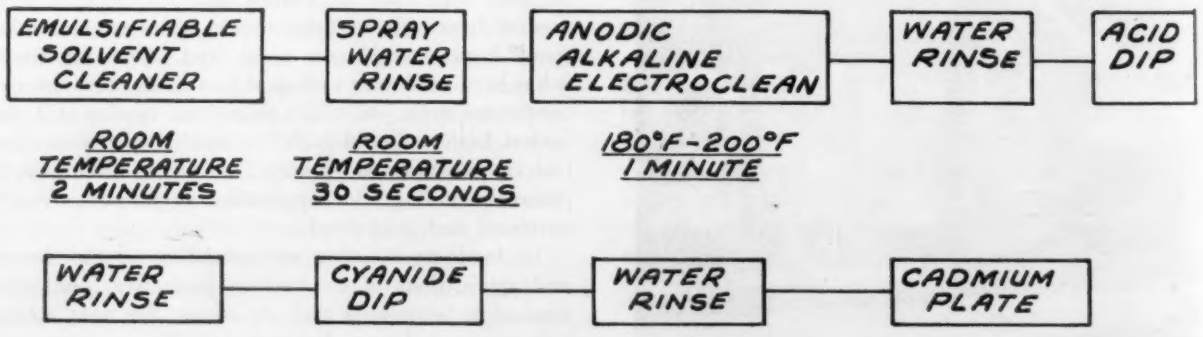
Solvent, Alkaline soak, Emulsion, Emulsifiable solvent, and Vapor degreasing.

SOLVENT CLEANING:

This type of pre-cleaning, in which an organic solvent such as gasoline, kerosene or benzene is used to dissolve greases, oils and similar materials, has a number of major disadvantages which prohibits general use in the metal finishing industry. Foremost is the fact that these materials are highly inflammable and are serious safety hazards. Of equal importance is the fact that these materials, rather than removing the soil, when used without hand wiping, act merely as a diluent resulting in a very inefficient job of cleaning. Since hand wiping is essential to the removal of insoluble solid soils by this technique, this type of operation is too expensive solely from the standpoint of labor cost. In addition, solvents quickly become contaminated and the redeposition of soil on cleaned work is inevitable. Lastly, but of considerable importance, is the deterioration of the subsequent alkaline cleaner caused by the drag-in of these solvents, a single point which is of sufficient importance to prevent the use of this method for much more than rare and infrequent applications.

ALKALINE SOAK:

Alkaline soak cleaning is a useful method of pre-cleaning in which emulsification, saponification, and displacement of heavy soils is accomplished in aqueous solutions of mixtures of alkaline salts, wetting agents,



Flow sheet of typical cadmium plating cycle utilizing emulsifiable solvent pre-cleaning.

and synthetic detergents. Alkaline cleaning dates back to the very origin of plating practice and, as such, is very widely accepted in both pre-cleaning soaking and in either the soak or electrolytic cleaner used prior to plating. With respect to pre-cleaning, low cost, compatability with the subsequent alkaline cleaners, excellent free rinsing properties, and effectiveness in removing a major number of the commonly found contaminants, are some of the features on the asset side of the ledger. However, there are very definite liabilities contingent with the use of alkaline soaking as a pre-cleaner. For example, a material of this type will remove most of the saponifiable soils, and in some cases, the non-saponifiables, but the long period of time required to accomplish the task (as long as 24 hours in some cases) is prohibitive in both the job shop and the plating department of manufacturers. Although an ordinary steel tank may be used for this operation, the fact that these tanks are operated at temperatures of 180°F. to boiling, makes this type of pre-cleaner undesirable in plants in which heating is a problem or tanks cannot be ducted for fume removal. Still another shortcoming of the alkaline soak cleaner, as with solvent cleaning, is the relative inability to remove solid soils.

VAPOR DEGREASING:

The effectiveness of vapor degreasing in pre-cleaning operations is dependent upon the solubility of a great many soils in the vapor of boiling trichlorethylene or perchlorethylene. Vapor degreasing has done an effective job of providing warm and dry parts where a subsequent "coloring" or other mechanical operation is necessary. It has overcome the disadvantage of solvent inflammability and the excessive immersion period required in an alkaline pre-clean. Consequently, it has been accepted in many metal finishing departments. Vapor degreasing, however, has brought a great many attendant disadvantages which must be given serious consideration before installation in a new plant is made:

1. Inability to remove solid soils, e.g. impacted buffing compounds except through physical removal with spray nozzles.
2. Special equipment is required having high initial and maintenance costs.
3. Solvent vapors are toxic.
4. The solvent residue left after degreasing is not free rinsing and consequently contaminates the alkali cleaners.
5. The elevated temperatures required in the operation often "bake in" buffing compounds and similar soils rather than removing them, consequently making their removal more difficult than if the vapor degreasing operation had been eliminated completely.
6. Water contamination in the vapor chamber, which occurs when the equipment is not operated under ideal conditions, may result in the formation of corrosive acids with resultant attack on both the equipment and the parts being cleaned.
7. Initial and replenishment solvent cost is expensive, particularly where spray nozzle techniques are used.

EMULSION CLEANERS:

Emulsion cleaners and emulsifiable solvent cleaners are often considered synonymous: in many cases proprietary emulsifiable solvents are often merchandised under the name of "emulsion cleaner," and vice versa. Although this error is not of earth-shaking proportions, it might be well to point out that in the strictest sense, emulsion cleaners are those composed of mixtures of solvents, emulsifying agents, wetting agents, blending agents and water. Emulsifiable solvents are similar in basic formulation except for the omission of the water component. In general, it may be stated that the emulsion cleaner is superior to emulsifiable solvents except for those instances in which water soluble residues, such as soldering fluxes, must be removed, and in cases in which the emulsifiable solvent has a flash point lower than that which is permissible in a particular plant. Since, in most cases, the addition of water merely reduces the pre-cleaning effectiveness of an emulsion type cleaner, the emulsifiable solvent is considered superior for general application and is therefore discussed in detail in this article. The overall concepts espoused for emulsifiable solvents may be generally applied to emulsion cleaners as long as the reader bears in mind that the solvency, i.e., the effectiveness of the cleaner, is generally reduced in proportion to the water content.

EMULSIFIABLE SOLVENT CLEANERS:

In briefly reviewing the advantages and disadvantages of solvent, alkaline soak, vapor degreasing, and emulsion cleaning as pre-cleaning methods, we have indirectly established the criteria for the ideal pre-cleaner. A pre-cleaner which combines the safety and low cost of alkaline techniques, the simplicity of solvent cleaning, the speed of vapor degreasing, a residue that is not harmful to the cleaning operation, and the ability to remove solid soils, to name a few qualities of the ideal pre-cleaner, would indeed be welcomed by both the plater and management. Although it cannot be said that emulsifiable solvents can meet all the requirements of the ideal pre-cleaner, it has a combination of physical characteristics that make it one of the most outstanding of the available processes.

Composition and Properties of Emulsifiable Solvents

The basic ingredient of the emulsifiable solvent is an organic solvent, usually petroleum, kerosene, or naphtha, with the latter being the preferred choice for most applications. To this base is added a material which is soluble in the base solvent and will act as an emulsifying agent for the mixture when the liquid is rinsed in water. This material is usually a soap obtained from rosin or fatty acids, e.g., potassium oleate. A blending agent, (usually a higher alcohol or a wetting agent) is also added to provide a homogeneous and stable mixture of solvent and emulsifying agent. Additional cleaning effectiveness may be obtained by the addition of surface active agents.

The list of properties that an emulsifiable solvent must have in order to be acceptable to a metal finishing shop or department is quite imposing. Prominent among the important attributes is a *flash point* that is high enough to permit its acceptability to the plant

and local fire departments concerned. In most locations throughout the United States a flash point above 100°F. is acceptable, classifying the material as a "safety solvent." For all practical purposes, the flash point is the temperature which the liquid must attain in order for the vapor immediately above the liquid surface to be capable of ignition. From this definition it may be seen that materials meeting this minimum flashpoint requirement of 100°F. are safe to use from practical viewpoint, in addition to the technical viewpoint of complying with local safety requirements.

DISSOLVING AND PENETRATING ABILITY:

The action of this type of pre-cleaner in the actual immersion operation is a dual one. Upon immersion of the soiled parts in a properly formulated material, the solvent soluble materials are dissolved and the insolubles are penetrated and wetted. Thus the ability to dissolve and penetrate determines, to a large extent, the effectiveness of the product.

EASILY EMULSIFIABLE:

The mixed residue left on the work after immersion in the emulsifiable solvent pre-cleaner, must be easily and rapidly emulsified in the subsequent water rinse inasmuch as the removal of solvent residue and solid soils is directly proportional to this ability.

PHYSIOLOGICALLY HARMLESS:

Neither the vapors from the cleaner nor the liquid itself should have any harmful effects on the tank operator. Protective clothing is not mandatory for this operation.

HARMLESS TO ALKALINE CLEANERS:

The thin film residue and drag-out resulting from the pre-cleaning operation must not degenerate or poison the alkaline soak or electrocleaner that conventionally follows. It must also be completely removable in the alkaline cleaner. The latter characteristic has been the primary cause of failure of the vast majority of emulsion type cleaners introduced into the plating industry and is the basic reason that many platers shudder when the subject of putting emulsifiable solvents into plating cycles is discussed. It must be remembered that improperly formulated emulsifiable solvent pre-cleaners can cause as many plating rejects as an improperly formulated alkaline cleaner. Consequently, any pre-cleaners of this type must have been specifically designed and satisfactorily tested for use in the electroplating cycle.

NON-CORROSIVE TO METALS:

For obvious reasons, the compound must not contain any materials or combinations of materials that will attack any of the commonly used base metals or electrodeposited metals. The latter factor is particularly important in the cleaning of buffed material such as copper or nickel.

ABILITY TO WITHSTAND HEAVY CONTAMINATION:

It is the very nature and purpose of the pre-cleaner to be used in the removal of heavy soils and it is consequently of extreme importance in a production facility that the pre-cleaner not be rapidly contaminated with the soil that is removed and thus cause redeposition of soil on cleaned parts. The solution, in order to be economically practical, must be capable of maintenance by periodic additions rather than dumping of the entire batch.

Operating Technique

The emulsifiable solvent precleaner is the first step in the cleaning cycle. Soiled parts are given a simple immersion in the solvent for as long a period of time as is necessary to provide effective cleaning. Vertical agitation can be used in instances where soils are particularly tenacious and the cleaning time becomes excessive. The agitation may be provided manually or may be accomplished by the use of a motor driven system. It is important to note that the cleaning of the parts is not completely accomplished in the solvent itself but rather is completed in the water rinse which follows. Specifically, the operator then could not expect the parts, as removed from the solvent, to be completely free from soil.

Operation of the solvent tank is very simple. Replenishments may be made periodically by draining approximately 20% of the tank from the bottom outlet, thus effectively removing the major portion of the heavy solids and greases that have settled in the bottom of the tank. Dumping of the entire bath is rarely necessary and occurs only when gross contamination is caused by the careless addition of large amounts of water or other foreign matter. Tank construction is usually steel, which may be designed with a sloping bottom to allow for more effective removal of sludge. In certain localities a fusible lead link cover is necessary for compliance with Fire Department regulations.

The cleaning operation is followed by a water rinse which is generally most effective when applied as a pressure spray of warm water. Conventional spray type nozzles may be used but it is emphasized that the effectiveness of the spray rinse increases with the increase of pressure. It is in the spray rinse that the solvent completes the cleaning action as it emulsifies with the water to provide a physical action which forces the soil to leave the metallic surface. The temperature of the rinse water cannot be specified since it is a function of the cleaner composition. In general, however, room temperature emulsifiable solvents are best operated with a water rinse temperature of 70°-120°F. Operating at either below or above the specified temperature will result in greatly decreased cleaning efficiency and definitely should not be attempted. In cases where parts having extremely deep recesses and blind holes which trap soil are being processed, it may become necessary to use a running water rinse tank to effectively rinse the parts. The running water rinse should then be followed by a spray rinse.

Depending upon the nature of the surface to be cleaned, the rinse may then be followed by either an inhibited acid pickle or rust or scale remover or, in the absence of these, by a conventional electrocleaner. Additional details on these pre-cleaning operations, however, are beyond the scope of this article.

Some Observations on the Electrodeposition of Tin-Zinc Alloys

By Bernard C. Lewsey

In this article the author discusses his experiences with tin-zinc plating over a period of five months, the difficulties he encountered and the methods by which he overcame most of them. The process requires rigid and continuous control. Other constituents remaining constant, caustic content plays by far the most important part in deciding the composition of the deposited alloy. With a zinc concentration of 2.5 g./l. and total cyanide 27-29 g./l., alloys containing 15%-30% zinc are deposited with caustic contents ranging from 5.5 to 11 g./l. A rubber-lined tank is best and great care must be taken to prevent steam pipes or other metallic connections from becoming anodic or cathodic. To maintain filming of the anodes, anode current density should not be less than 15 amp./sq. ft. Some tin-zinc deposits are prone to blister on baking; the reason for this is not clear, neither has a reliable solution to the problem been found.

THE electrodeposition of tin-zinc alloys is a comparatively recent process; in fact, it has only been developed commercially since the war. The deposit has been found to be extremely useful in certain directions although some platers have achieved only indifferent results. Apart from literature issued by the Tin Research Institute, the originators of the process, not very much information has been published on the process.

It is the intention of this article to give a survey of practical experience of this process in a trade plating shop over a period of five months in the hope that the author's experience may prove useful to others. It is only concerned with alloys containing not more than 30%, and preferably 25%, zinc. It might first be pertinent to point out that tin-zinc alloy plating is always a specialized and carefully controlled process. This is in contrast to cadmium and zinc plating and the author feels that if the same control were exercised in the deposition of these last two metals, and particularly if they were properly passivated, they might well be found equal to tin-zinc under general service and severe conditions.

Plant Requirements

Whilst a mild steel tank might at first sight seem to be the obvious choice, experience has shown that it should be avoided. When a steel tank is used there is no doubt that some iron passes into the solution as ferrocyanide, and this can cause trouble. This trouble can be quite pronounced when part of the tank becomes anodic due to stray currents. This condition also arises when the anodes are too near to the sides of the tank; they should not be less than 4 inches and preferably 6 inches from the side of a plain steel tank which is, of course, uneconomical as valuable tank space is lost. Again, the author has known the steam pipe used for heating the solution to become cathodic at the entry and anodic at the exit, although the whole of the pipe is often in one piece.

A trouble which arises when an iron tank becomes cathodic is stannite formation which, if allowed to get out of hand, will cause rough black deposits. The stannite is, of course, formed as a result of the tin deposited on the cathodic areas, dissolving chemically when the tank is idle. In a particular instance, large volumes of hydrogen peroxide were added periodically, but even so the trouble was never completely overcome. Glass lining is not to be recommended as glass is soluble in the solution and, in all probability, will eventually cause trouble. The product, sodium silicate, which enters the bath is undesirable. From experience, the author prefers a hard rubber-lined tank which introduces none of the above difficulties and ensures that no tank space is wasted since the anodes can be suspended close to the side.

Heating by steam coil is quickest and cheapest but again stray currents can cause the steam pipe to become anodic or cathodic. Heating by electricity perhaps is ideal. If a plain iron tank should be employed, care must be taken when using any external system of gas heating to avoid disturbing the sludge which is formed.

During the operation of the process, an objectionable spray is evolved from the solution and causes irritation to the nose and eyes, some operators being more susceptible to it than others. It is, therefore, desirable to remove this spray by the usual method.

Source of current can be either motor generator or rectifier but it is most important that the power available should be adequate both as regards current and voltage. From experience, a tank 6 ft. x 3 ft. x 2 ft. 9 in. deep will process comfortably about 24 sq. ft. of cathode surface, working at 15 amp./sq. ft. This will require 360 amps., at 4-4.5 volts, for which a generator or rectifier of 6 volt 500 amp. capacity would be adequate.

One of the most important features of this process

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is the filming of the anodes. It is normal to employ tin-zinc alloy anodes and these are definitely less easy to keep filmed than are tin anodes in the stannate bath. The anodes should definitely be connected with flexible leads and, from experience with still tanks, it has been found best to load the tank first with the work to be plated, switch on with a starting voltage of about 6, and then lower slowly each anode separately into the solution. This makes sure that all anodes are filmed and the voltage should remain stationary after adjusting supply to the normal current density and voltage, usually around 15 amp./sq. ft., and 4-4.5 volts.

The author has only used 80% tin-20% zinc oval cast anodes with screwed-in iron hooks. The appearance of these anodes when filmed varies considerably; some look very dark green, others dark brown, while others assume a mottled green and brown color. Sometimes, for no apparent reason, some anodes suddenly lose their film and turn black with a loose deposit which floats off into the solution. If this condition is allowed to persist, the usual trouble arises. The offending anodes can be refilmed by increasing the voltage and lowering them slowly into the tank, after washing off the loose powder. In practice, once the tank has been loaded, it is best to unload and re-load it by what is commonly known in the trade as "working round the tank, that is to say, removing one string of work or rack at a time and replacing it by another before removing the next. In this way, the necessity for re-filming the anodes is avoided.

The author's experiences with filming of anodes do not tally with those of the Tin Research Institute. The literature published by the Institute recommends an anode current density of 7½ to 15 amps./sq. ft. It was found in practice that the lower limit led to defilming of the anodes apart from the fact that at this low current density too many anodes were required and the tank was overloaded with anodes.

After several experiments the best anode current density was found to be around 20-25 amp./sq. ft. and the anodes were disposed more favorably in the tank with regard to the cathode. The particular work being plated necessitated the use of internal as well as external anodes. It was noted that when individual readings were made on each anode, the current on the internal anodes was 30 amps. and that these anodes always had a good green film on them and never became defilmed. The other anodes gave readings of between 15 and 25 amps. These anode current densities appeared to be satisfactory for normal working and, with a tank load of 24 sq. ft. taking a current of between 360 and 380 amps., 30 anodes having a total surface area of 15 sq. ft. seemed reasonable conditions to adopt.

The Plating Solution

The initial make-up of the bath as prescribed by the Tin Research Institute to obtain the 80/20 tin-zinc deposit is as follows:

Tin	30 g./l.
Zinc	2.5 "
Free caustic soda	4-6 "
Total sodium cyanide	25 "

In making up fresh baths, the author always aims at a lower caustic content than this to allow for any free caustic soda which may be in the sodium stannate. The caustic figure can then be adjusted to the required value after a simple analysis. The author has made up many baths in this way and has always been able to obtain an analysis very close to the desired formula for all constituents.

The working instructions state that with a caustic soda content of 4-6 g./l., a deposit containing about 20% zinc can be produced. In the author's experience, these figures must not be taken too literally. It is well known in the deposition of alloys from cyanide solutions that the suppression of one of the constituents leads to an increase in another and vice-versa, and it is very pronounced in this particular instance. The free caustic soda concentration exerts a very important influence on the composition of the deposit and it is here that some interesting and perhaps surprising results have been obtained.

The component on which the work described in this paper was carried out can be visualized as one side and two ends of a box, length 11 in., depth from front to back 7 in., and width of back 5 in. Thickness of deposit was required to be a minimum of 0.0008" on the inside surfaces and 0.0001" on the outside. Total surface area was 3 sq. ft. so that current requirement was 45-50 amps. per article with a plating time of 1 hour. The deposit was to contain as nearly as possible 25% zinc. An internal anode was used to help achieve uniform current distribution.

Recommended temperature of operation is 158°F. but there does not seem to be any harm in allowing it to rise to 160°F.

Effect of Caustic Content on Composition of Deposit

The first components were plated in a 40 gallon tank with all the above requirements strictly adhered to. The solution on analysis was within the limits of the recommended formula and the caustic content was 5.6 g./l. Temperature was maintained by steam heating. The current density was 15 amp./sq. ft. and a test piece plated at the same time as the article in question, that is for 1 hour, received a deposit 0.0009" thick. Zinc content was only 18% and it was, therefore, decided to raise the caustic content to 10 g./l. Three further tests made on test pieces gave the following results: 28%, 30% and 33% zinc; thicknesses 0.0009", 0.0008" and 0.0011". The zinc content of 33% was surprisingly high but, during the course of investigations, unexpectedly high concentrations of zinc were obtained in one or two other cases as are noted below.

At this stage a larger tank was installed, namely, a mild steel one containing one hundred gallons of solution, steam heated. The solution was checked as before and a number of test pieces were plated at varying caustic contents with the following results:

NaOH g./l.	% Zinc in Deposit
7.6	17
8	24
8.5	24
10.5	32
10.4	28
9.0	25
10.0	28

thickness in all cases was close to 0.001". Here again there are particularly low and high figures for % zinc, but apart from these, it appeared that a caustic figure of around 8 to 10 g./l. should receive the most consideration to obtain 25% zinc in the deposit. Excluding the high and low figures, the average of these results was 26% zinc for a 9.0 g./l. caustic concentration.

In this tank stannite formation occurred due to the side of the tank becoming cathodic, and work came from the tank somewhat rough with black patches on the surface. Quantities of 100 vol. H_2O_2 were added from time to time and this treatment succeeded in keeping the stannite down to a value at which it did not visibly affect the deposit. It is interesting to note that these peroxide additions did not reduce the cathode efficiency to any noticeable degree because thicknesses remained normal.

Production had to be increased and a 300 gallon mild steel tank was then installed. With the knowledge previously gained, polythene sheeting was hung on all four sides of the tank and held down in the solution with a steel rod fitted at the bottom of the sheets. The anodes were placed 4 in. from the side of the tank. In spite of this precaution, after a short time the tank became cathodic and the same trouble was experienced as before. This tank was operated for about 3 weeks and by the end of this time stannite formation could not be checked sufficiently to give a good deposit.

The initial make-up of the bath was as before, the caustic content being 7 g./l. Before commencing operations it was raised to between 10 and 11 g./l. with the hope of giving the desired percentage of zinc in the deposit, that is, from 25 to 30% zinc. The first test piece showed a thickness of 0.001" and zinc content 26%. Further test pieces were processed during production. Results obtained on these test pieces are interesting and are shown below.

NaOH g./l.	% Zinc in Deposit
10	26
10	25
10.3	26.3
10.8	33
11	28

Here again there is an abnormally high figure for zinc, the other four being reasonable and comparing favorably with figures obtained in the previous experiments.

Blistering After Baking

Before describing further experiments it may be as well to discuss the cleaning operations before plating. The components were of mild steel having a large number of spot welds all over their surface, this being necessary for their construction. They also contained a short sealed copper pipe brazed on to the steel component. After degreasing in trichlorethylene vapor, they were pickled in a hydrochloric-phosphoric acid pickle for a few minutes only, rinsed, scoured with pumice all over, rinsed, cathodically cold cleaned, rinsed, dipped in 10% sulphuric acid, rinsed, and then to the plating tank. The writer believes this cleaning to be a typical one and fully realizes that it can be modified. It is a method that has been in use for a long time for preparing steel for plating in alkaline solutions and it has, generally speaking, given satisfactory results. With this treatment, the percentage of blistered components was negligible, perhaps not more than 1%. All components were passivated using the 2% chromic acid solution.

A stage had now been reached where experience led to the installation of another tank, this time a hard rubberlined tank of 400 gallons capacity which had been used previously for nickel plating and, later, as a hot water seal for anodizing. The one hundred gallons and the three hundred gallons of solution were transferred to the new tank, the solution was analyzed and only required the addition of about 0.3 g./l. of zinc to make the content of the solution up to 2.7 g./l. Plating conditions were the same as before and temperature was maintained by steam heating.

The first test piece had the required thickness and the zinc content of the deposit was 26%, caustic content being 10.6 g./l. The next test piece gave a zinc content of 28%, a figure which was confirmed by the customer, at a caustic content of 10.8 g./l.

At this stage of the production run the customer discovered that blistering was occurring over various areas on the surface, particularly around brazed parts, during a certain treatment the components were receiving after plating. This treatment necessitated a temperature of 250-300°F. Blistering also occurred during baking of the paint at the same temperature. It was felt that the trouble was not due to cleaning. In an endeavor to prove this, three components were plated with cadmium, tin and zinc, to a thickness of 0.001", each part being cleaned by the method described. After plating they were baked for 30 minutes at 250-300°F., no blistering occurring anywhere on the surface of any one of the three components.

It is possibly well known that blistering sometimes occurs on cold rolled steel sheet when zinc plated and that only drastic acid treatment can overcome the trouble. Thus, a tank load of components was tin-zinc plated after it had been dipped in 30% nitric acid. This treatment produced a very matte etched surface. After plating, the components were baked for 30 minutes at 300°F., but blistering was just as bad as before. A further tank load was plated after shot blasting and alkaline cleaning but again with no reduction of blistering.

In an endeavor to get to the bottom of this trouble, some components were plated in other than the author's plant and this led to some most surprising findings not only as regards blistering but also as regards proof of the effect of caustic content on composition of the deposit. The most surprising results were obtained in tests on a component plated in an automatic installation by a company who had been operating the process for a number of years. This company believed that they had produced a deposit of 0.001" in thickness containing at least 25% zinc. A section was cut from the back of the component, actually a three inch strip from top to bottom. For analysis, a piece was cut from the center of the strip and it was found that the inside surface of the speci-

men had a thickness of 0.00025" and a zinc content of 21%. As these figures were so much lower than anticipated, another test was made on a similar piece with the result: thickness 0.00020", zinc content 20%. Another test showed a thickness of 0.0006", zinc content 21%, on the outside surface. The author learned afterwards that the caustic content of the solution in which the component was plated was 4-5 g./l. and thereupon ceased to be surprised at these low figures, particularly since the zinc and cyanide contents were normal. Perhaps these results help to explain why tin-zinc plating has so often proved disappointing in service.

One very interesting point was that this component did not blister on baking. Thinking that there might be some connection between blistering and high thickness and zinc content, experiments were carried out after the caustic content of the author's tin-zinc solution had been reduced from 10.0 g./l. to 6.0 g./l. by the addition of 28 lbs. of sodium bicarbonate. This first reduced the caustic content by 2 g./l., and continuous heating reduced it down further to 6.0 g./l. A batch of components were cleaned by the method previously described and plated at 15 amp./sq. ft. for 35 minutes. The idea was to produce an alloy containing about 20% zinc and having a thickness of 0.0006" with the idea that perhaps they would not blister on baking. Sections were cut from the component and thicknesses of 0.0007" on the outside and 0.00021" on the inside surfaces were recorded. The percentage of zinc in the deposit on the outside was 22% and on the inside 20%, which figures are compatible with the author's previous results. Blistering, however, still occurred but was much less pronounced than before. This aspect of the matter is still under investigation.

Passivation of Tin-Zinc Deposits

The passivation of tin-zinc deposits is of interest and a few points are perhaps worth recording. It was found in practice that the 2% chromic acid solution at 70°C. produced the most consistent results when changed frequently. This avoids unnecessary build-up of sulphate from rinse waters. Sulphate encourages staining and excessive discoloration.

A new chromic acid dip is a slight guide to the zinc content of the deposit. If the temperature and time of immersion are controlled, a deposit with low zinc content passivates with not very much change in the color while that with a higher zinc content tends to change to a very light brownish color or at least to show a definite change in appearance. However one can be deceived by appearances.

Conclusions

All methods of analysis used in this work were as recommended by the Tin Research Institute and, in the author's opinion, present no real difficulty with the possible exception of the estimation of zinc. The end point in the ferrocyanide titration may be confusing at first but one soon gets used to it once the analysis for this metal has been carried out a few times.

It is claimed that there is no change in the appearance of the deposit with varying zinc content, but the author has noticed a change from white to off-white or perhaps getting into a grey color during the many trials that were made. It will be appreciated, however, that certain impurities which can get into a solution will cause a deposit to become off-color and, therefore, that one is liable to be misled.

It is regretted that no tests for cathode efficiency were made but these were not considered essential in view of the satisfactory thicknesses that were attained. It should be remembered that this paper is based on shop practice and not a full scale laboratory investigation which is also the reason why experimental results were not obtained in duplicate or triplicate. The test pieces used were of mild steel sheet 5 in. x 5 in. and smaller sections cut from them for testing were usually 2 in. x 2 in. There may be some difference in composition of deposit produced on these test pieces as compared with that produced on components of irregular shape. The author has found this to be so in practice.

The zinc content of the solution during the whole of the work was kept between 2.4 g./l. and 2.9 g./l., the high figure being attained in the 100 gallon tank when additions were made to compensate for dragout losses. The tin content was not above 33 g./l. and the total cyanide between 27 and 28 g./l.

Three conclusions are outstanding. First, the deposition of tin-zinc alloys requires very rigid and constant control under laboratory supervision. Second, the plating installation itself should be a first class job and should receive close attention from maintenance. Third, the caustic content of the solution, other constituents being constant, plays by far the most important part in deciding the composition of the alloy. It seems conclusive that with a caustic content ranging from 5.5 g./l. to 11 g./l. a range of alloys can be deposited containing from as little as 15% to as much as 30% zinc, quite a wide range for such a small change in caustic content. The object of publishing this paper is to stimulate discussion on production plating of tin-zinc alloys for which there is undoubtedly a wide field of application.

EXTRACTS
From the World's Plating Literature

Alkaline and Electrolytic Degreasing

A. Pollack; *Metalloberflaeche*, vol. 6, No. 10, pp. B146-B148.

The principle of alkaline degreasing depends on the fact that surface-active compounds, which possess peptizing, emulsifying and wetting properties, considerably improve the cleaning effect obtained. Modern alkaline cleaning reagents accordingly embody practically always surface active compounds. The amount of such surface-active compounds incorporated in an alkaline degreasing agent generally is of the order of 0.5 to 5 percent. Of the various raw materials available for this purpose, the primary position is occupied by the alkyl sulfonates and the alkylaryl sulfonates; also fatty acid condensation products are often used; the fatty alcohol sulfonates (alkyl sulfates) are not so frequently made use of. With the spray degreasing agents, satisfactory use has been made of the non-ionic products, which foam very little or not at all. Combinations of anionic and non-ionic wetting agents would appear to be the most effective. Cationic compounds have achieved no significance in alkaline cleaning but they are quite effective in the neutral and acid media.

Up to a short time ago, the alkali cleaning media were salt mixtures in which the caustic alkalies and alkaline carbonates were dominant, and they were regarded as technically more important the more strongly alkaline they were. Research has established that, in the case of metal degreasing, it is a question not so much of the saponifying action of the alkalies but much rather the effect depends on the peptizing, emulsifying and wetting properties of the degreasing solution and accordingly, less on the chemical and much more on the colloidal chemical properties of the cleaning agent. On the other hand, a saponifying action occurs only to a very small extent with a modern degreasing cleaner. The waning significaince of saponifying action in metal degreasing practice is indicated by the fact that the trend in metal cleaning technique has been in the direction of the ever greater use of the unsaponifiable mineral products. It is generally agreed now that effective degreasing action is a question neither of saponification nor of emulsification in the main, but a reduction of the boundary surface tension oil-water and the consequent contraction of the oil film and its break-up into drops. Against the saponification theory of degreasing can be mentioned the generally accepted fact that weak alkalies often degrease better than stronger ones and also that mineral oils are most often easier to remove than saponifiable fats and particularly lanolin.

The silicate degreasing agents are of great technical importance. These comprise the tri- di- and metasilicates. The cleaning action of the silicates depends not so much on the alkali constituent but much rather on the silicic acid which shows a high surface reactivity when present in colloidal form in the solution, and apparently is also effective on the basis of its absorption properties, by which a certain transportation removal effect of the dirt is obtained. The most effective alkaline degreasing solutions accordingly contain a predominant proportion of silicates with some caustic soda, sodium pyrophosphate as a water softening medium and surface reactive compounds, generally a compound with principally a wetting action and another with a stronger emulsifying effect. Such cleaning media are already effective in concentrations of 1-3% while cleaning mixtures poor in silicate only reach their full effectiveness in concentrations of 3-5%. The silicate rich media have been most usefully employed particularly in spray degreasing processes.

Electrolytic degreasing is arranged as the final cleaning stage before plating and, being the last stage, has considerable significance as regards the quality of the subsequent plated metal coating. The electrolytic degreasing treatment should not be too prolonged so that internal stress is not set up in the plated coating by hydrogen absorption at the cleaning stage. This hydrogen absorption, in addition, can lead to defects in the plated coating such as pores, cracks and flaking. With electrolytic degreasing conducted at 6-8 volts and 3-10 amps./sq. dm., 1½ minutes should be regarded as the maximum degreasing time. Experience has shown that it is better to degrease for a short time with a strong current than longer with a low current. Baths used for electrolytic degreasing formerly were comprised of solutions of caustic soda, sodium carbonate, trisodium phosphate and addition of silicates and cyanides, but most recent practice is to use concentrated solutions of silicates with additions of surface-reactive substances, particularly ethylene oxide condensation products. Cathodic and anodic degreasing can be conducted; a combination of these two processes with cyclic current reversal has been found very effective.

Plating Faults and Their Avoidance — Roughness, Clouding. Low Corrosion Resistance

Galvano (Paris), Vol. 21, No. 187, pp. 11-13.

Roughness of a plated deposit is a more serious fault than formerly because of the greater employment of bright plated deposits and the avoidance of buffing and polishing operations. Roughness of a deposit can also influence the corrosion resistance; to remove the roughness, considerable buffing is necessary which reduces the thickness of the deposit and can also lead to a pitting effect by removal of the surface roughness peaks. The origins of roughness can be classified into two categories according as to whether the fault can be attributed to the base metal or to the electroplating bath. These two causes can be simultaneously present during the plating and this renders the diagnosis of the problem a more difficult matter, as regards finding the precise cause and origin. The preparation of the surface for plating is obviously a fruitful cause of roughness defects. Dry polishing of a steel surface can be a frequent offender in this direction; minute, dry pieces of the metal will adhere tenaciously to the steel surface and are difficult to remove; these adherent particles then constitute the starting point for peaks in the plated surface and consequent roughness. Insufficient degreasing can also lead to roughness of the

plated coating. Vapor degreasing can serve to remove the polishing products and leave on the polished metal surface insoluble solid particles; thorough rinsing after degreasing is the obvious remedy in such case, and the most effective means of ensuring a thoroughly clean surface is to give a pressure spray rinse after degreasing, particularly if vapor degreasing is being used.

Particles in suspension in the plating bath will give rise to rough deposits by these particles settling on the work in the bath, particularly on horizontal surfaces, then becoming incorporated in the plated deposit. Modern filtering systems have largely eliminated this trouble which was formerly very common. These particles originate mainly from the anodes and, even though a filtration system is installed on the bath, this trouble should be recognized as an anode phenomenon and dealt with at the source. The anodes should be scrutinized as regards purity and also as regards solution conditions. Bagging of anodes can be undertaken in acid baths but is not so suitable in alkaline baths. Even bagging will not prevent the finest particles of metal passing into the solution. Recent practice has been to employ porous diaphragms in high speed alkaline copper baths and it has been found that roughness can under some circumstances originate from these very diaphragms which were installed to cure this ill. Even when all precautions are taken in a bath to keep the solution free from suspended particles, roughness can still be encountered, due to particles falling into the bath from external sources such as dirt particles from walls and ceilings, rust particles from girders and corrugated roof and wall sheeting etc. Strict cleanliness in the plating room is the cure for this. Excess carbonates in alkaline copper baths and phosphates in nickel baths can also give rise to rough deposits. Steel parts which are being plated can be more or less magnetic, either from previous polishing treatment or when treated in the bath. They will, accordingly, attract fairly strongly metallic particles which are susceptible to magnetism and which might otherwise have dropped to the bottom of the bath, such as nickel metal particles, for example, in a nickel bath.

Insufficient resistance to corrosion of the plated coating may arise from several causes. The standard tests applied are a minimum thickness of the plated coating and a given resistance to the salt spray test under set conditions. A great deal of controversy exists regarding the effectiveness of these corrosion tests and specifications. Certainly, thickness of the plated coating in itself can be misleading and no certain guarantee of any precise corrosion resistance. Thus, the soundness of the coating or lack of soundness will influence the resistance or susceptibility to corrosion to a considerable extent, as for examples, pinholes, pitting or fissures. Thus again, it has been found that the presence of quite small quantities of copper in a nickel bath can reduce by half the resistance of the nickel to the salt spray test. Stress in the plated coating and lack of ductility can also act adversely against a satisfactory corrosion resistance. Thus the ductility of bright nickel is less than that of matte nickel from a normal Watts bath. Bright nickel-chrome coatings have been known to fail in service by fissuring, caused by an unduly highly stressed plated coating. Although the ductility of bright nickel, for obvious reasons, can never equal that of a matte nickel, there are certain measures which, when adopted, can serve to improve the position regarding a bright nickel coating in this respect.

Control in Chromium Plating

Galvano (Paris), vol. 21, No. 186, pp. 22-24.

Decorative chrome is considered and the small plating shop does not usually pay much attention to thickness control; the essential requirement with the small scale plater is to cover uniformly the sub-coating of nickel so that no area can be observed around holes or at the base of a recess. Also, no "miss plating" at the center of a large area and to obtain the maximum penetration so that when the ware is removed from the bath the deposit is as brilliant as possible and there is no necessity for polishing which, however carefully executed, will leave a light veil which enables one to recognize that the wheel has been used. However, thickness measurement of the deposit is of importance for control purposes and the necessary techniques are as follows. Thickness can be measured by either of two methods, comprising chemical solution or the drop test.

For the chemical solution test, the chromium deposit is dissolved on a surface of about 2 sq. cm. The area of attack is limited by wax or a similar protective substance not attacked by 50% by volume hydrochloric acid which is the reagent employed. The HCl solution is neutralized by ammonia and 1 cc. excess is added. To this is added 20 vol. hydrogen peroxide in amount of 0.5 cc. per mg. of chromium present. The solution is covered with a watch glass and heated on a water bath for at least an hour. It is then raised to the boiling point to remove the final trace of dissolved oxygen and, after cooling, 2 drops of ammonia are added. The solution is filtered and made up to a known volume which can be 10 to 30 cc., according to the chromium content. The chromium is then in the form of ammonium chromate whose yellow coloration is stable. The chromium is determined by colorimetric comparison with standard solutions of similar concentrations.

The drop method, although less precise than the preceding test, has the advantage of being rapid and of giving to the plating shop a sufficient approximation of the value of the deposit as regards its thickness. A more or less high porosity of the deposit can falsify the interpretation of the results. The test can, however, provide a sufficient working control guide for decorative chromium.

Control for continuity of the chromium deposit is not often exercised with decorative chrome; the small plater usually contents himself with visual examination to ascertain if the chromium has covered entirely the sub-coating of nickel. The continuity of thin chromium deposits on nickel can be verified by immersion or washing the part with the following reagent: sodium chloride 120 grams; cupric chloride crystals 170 grams; distilled water 1,000 grams. An excess of cupric oxide is placed in the flask containing the solution thus prepared to saturate the free acid of the reagent. The decanted and filtered solution is used for the test. The test piece is degreased with ether-alcohol mixture and dried. It is then given an immersion for one minute in the above reagent. It is then washed in running water and dried with a clean rag. Places where nickel is not covered assume a matte and cloudy aspect apparent against the unaltered surface of the chromium.

Abrasive Methods—Surface Treatments—Control
Electroplating—Cleaning—Pickling—Testing

SHOP PROBLEMS

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Plating Die Castings

Question: We are confronted with a copper-nickel-chrome job on die cast, which must meet the following specifications:

.0002 — copper
.00055 — nickel
.00001 — chrome

It has been our experience that if we can come up to requirements on the copper plating it is necessary for us to copper-buff to receive the requested brightness. We might add that we can get the requested brightness by cutting down on the copper requirement.

We are also having some difficulty with rough nickel deposits, especially where there are some cavities in the original die castings. We have had an opportunity to examine some of the parts that were plated in another city, with excellent results. We are now using a rochelle copper bath, and brite nickel. Our cleaners are set up to use either way, with a reversing switch. We would appreciate any suggestions from you as to solutions and equipment necessary for a job of this nature.

E. F. S.

Answer: The rochelle salt copper solution does not produce a deposit with sufficient luster to permit bright nickel plating without intermediate buffing. Any of the bright copper formulations on the market will be suitable for this purpose; however, we are enclosing a list of suppliers. No other changes in your procedures would be necessary, except for a copper strike.

The rough nickel deposit in the recesses of the die-casting may be due to insufficient copper which would result in precipitation of spongy nickel by displacement. Many plants copper strike and then build up the desired thickness of copper in a bright plating solution, employing periodic reverse for improved results.

Filling Pits by Plating

Question: We are experiencing difficulty in re-chrome plating various diameter pistons. The original chrome plating on the piston becomes pitted during its service life and requires stripping (by grinding) and re-plating. The pitted area permits the hydraulic fluid to by-pass the seals; therefore rendering the piston unserviceable for aircraft use.

What can we use to fill up the pitted area prior to the chrome plating? We have used special designed anodes at the pitted area as an aid in chrome plating, without success. It is not practical, nor do we desire to grind the entire length of the piston to clear out the pits. Our plating facilities include chrome, nickel, silver, cadmium, copper and anodizing. Heat treat furnaces to 2500°F.

E. P. M.

Answer: We do not believe you will have any success in filling up pits by electrodeposition. It would be necessary to fill these areas with a weld metal, followed by grinding, or to grind down the diameter to a level below that of the deepest pit. If the latter method is used, nickel would be better for building up the diameter, rather than chromium, because of the thickness of deposit which will be required.

Plating on Cadmium

Question: Our plant is interested in applying a flash coat of nickel over a fairly heavy coat of cadmium. This final nickel deposit is not to be buffed and does not need to exceed 0.0001" thickness. However, we cannot tolerate any peeling.

We would like to have your comments concerning what type of solution to use, and if you feel that this can be done in mass production without serious difficulties. Our plating facilities consist of both barrel and still-plating equipment. It seems that the plating of nickel over cadmium is extremely rare and it is difficult to find any technical advice on this subject.

A. B. C.

Answer: Cadmium is prepared for plating in the same manner as zinc, namely mild cleaner, rinse, mild acid and rinse. A thin nickel deposit may be applied directly from the high sulfate type die-cast nickel, the formula for which appears on page 317 of the 1953 edition of the *Metal Finishing Guidebook*, or from a pyrophosphate type nickel supplied by Zialite Corp., 92 Grove St., Worcester 5, Mass. If a regular nickel bath is to be used, a thin copper deposit should be applied first from the cyanide solution.

Chromium Direct on Zinc

Question: Can you tell us if there is any known method of chrome plating directly on zinc plated steel?

H. G. C.

Answer: Chromium deposited directly on zinc or zinc plated steel will be dull, but success has been claimed for deposits directly on bright dipped and passivated zinc surfaces. The usual procedure for obtaining bright chromium deposits is to bright copper plate first.

Hard Chromium Plating

Question: Will you kindly advise me where I can find practical information on hard chrome plating of cylindrical plug gages, thread plug gages, ring gages (where the I.D. is the gaging surface), and taps, all

made of high speed steel. I need to know how to plate these gages without taper, and without changing the angle on thread gages.

Much of the printed information I have found is not applicable to gages, or is too general to be of any value. For example, take the advice given to A. G. O. on page 81 of your September issue. Your advice is that the position of his anodes "should be such that the deposit thickness will be uniform from top to bottom." That is fine, but how do you position them to obtain such wonderful results?

Again, some authorities recommend using a solution at 130 to 140 degrees F., and a current density of 2 to 3 amps. But with such great differences. it is impractical to plate .0002" or .0003" or even .00004" with any degree of accuracy.

C. R.

Answer: The type of information you are seeking would not be available in any of the publications we have ever read. For example, how to position anodes to obtain uniform results. It is being done every day but the exact amount by which an anode should be shorter than the part being plated or how much of the top of the anode should be shielded must be determined by the plater himself. There are no tables or formulas for these things. If there were, platers wouldn't need any experience!

We do not agree with your remark about it being impractical to plate with any degree of accuracy when authorities recommend a temperature of 130-140 degrees and a curent density of 2 to 3 amps. per square inch. All platers know that these are the limits for usual operation, not that any particular tank can vary in temperature so much during the plating cycle or that the current on a piece can be changed from 2 to 3 amperes per square inch without changing the thickness produced per hour.

Corrosion of Lead Plated Copper

Question: Could you tell me why lead coated copper sheets, after being boxed in wood cases for some time, have the lead on part of the sheet oxidize and form a red lead oxide powder? These sheets are first cleaned in NaCN then electroplated with tin and then lead coated. How can this be prevented? Whenever the box is opened there is a dampness in it. Is this condition due to packing warm and damp lead coated sheets?

R. J. M.

Answer: The oxidation of the surface is most likely due to the moisture and acids in the lumber of which the box is constructed, although packing of damp sheets of lead coated copper would be a contributing factor. Of course, the sheets can be thoroughly dried before packing.

Use of a petroleum base corrosion preventive on the sheets will probably be most effective, if permissible. Otherwise, a box liner of waterproof paper may be necessary.

Tarnish Prevention of Bronze

Question: Do you know any after-treatment for bronze plates, Cu:Sn 9:1 or for copper-tin-zinc alloy 80:8:12 to keep the surface brilliant and free of oxides without lacquering?

A. J.

Answer: The following treatment has been suggested for tarnish prevention of bronze and other copper alloys:

Potassium nitrate ..... 2 oz./gal.
Potassium dichromate .. 6 "

Cathodic at room temperature and 2-3 volts for 1-5 minutes.

Brush Brass Finish

Question: We would like to know how to produce a "brush brass" finish on lamp parts. The finish should not be pale in color and should have a nice sheen to it.

N. L. M.

Answer: There are many variations of this finish and we would have to see a sample in order to advise as to the method of production. Whether the finish is pale or deep will depend on the brass deposit, not on the brushing method.

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PATENTS

Method of Manufacturing Plated Articles

U. S. Patent 2,653,211. *Sept.* 22, 1953. *O. E. Andrus, assignor to A. O. Smith Corp.*

In a method of fabricating a plated article, the steps of providing a layer of corrosion-resistant metal on a ferrous metal base member in the region of a proposed joint between the ferrous metal base member and a second member, thereafter plating the base member with corrosion-resistant plating metal, said plating metal overlapping said corrosion-resistant layer, and then making a corrosion-resistant weld between the corrosion-resistant layer and said second member, the edge of the weld being spaced from the edges of the corrosion-resistant layer adjoining said base member, with any cracks occurring in said plating metal adjacent said weld tending to expose said corrosion-resistant layer to corrosion rather than the base member.

Burnishing Machine and Method

Reissue U. S. Patent 23,715. *Sept.* 29, 1953. *C. C. Kinker and J. J. Murtagh, assignors to Gerity-Michigan Corp.*

An article burnishing machine having a tank with its bottom inclined to a horizontal and adapted to hold a burnishing liquid in the lower side portion thereof, and to drain liquid to said lower side portion from elevated portions of the tank bottom, a burnishing liquid in said tank, an endless article-carrying means movable through the tank and liquid therein on an incline substantially corresponding to that of the tank, and means *comprising a tool having a plurality of separated elongated flexible rubber rubbing elements* operable to coact with and buff an article carried by said first means when the article is in said liquid.

Cobalt Plating

U. S. Patent 2,653,127. *Sept.* 22, 1953. *A. Brenner and P. Burkhead, assignors to the United States of America.*

As a bath for the electrolytic deposition of a metallic material selected from group consisting of cobalt and cobalt-molybdenum alloy, a caustic-

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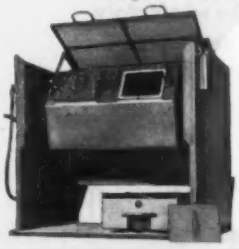

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P. O. Box 988 — Phone 3-5578

FOREIGN REPRESENTATIVES: CANADA — Windsor — Roto-Finish Canada Limited • ENGLAND — London — Roto-Finish Limited — 39 Park Street — Mayfair • AUSTRALIA — Melbourne — A. Flavell Pty, Ltd. • HOLLAND — Delft — N. V. Roto-Finish Maatschappij — Rotterdamse — WEG 370A • AUSTRIA, GERMANY, SWITZERLAND — Frankfurt a.M. — Metallgesellschaft A.G., Germany • ITALY — Milan — Societa Roto-Finish a R.L. — Sesto S. Giovanni — Viale E. Marelli 31 • FRANCE — Paris — Sociote Roto-Finish, 70 rue de la Republique-Puteaux (Seine) • BRAZIL — Rio de Janeiro — Commercial E. Industrial de Formos Werco, Ltds.

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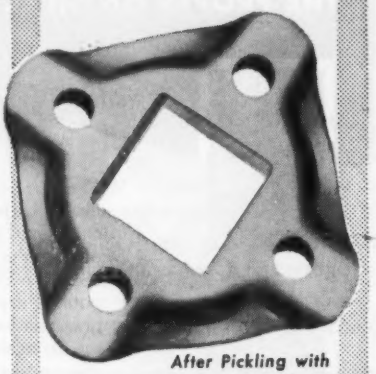
Before Pickling



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Use a material that:

- Stays inert until dissolved in water.
- Attacks only scale and rust.
- Does not "over-pickle."
- Is safe in handling and in storage.
- Does a sure, dependable pickling job.
- Can be used hot or cold, in tumbling barrels, as well as in tanks.

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free, strongly alkaline solution which essentially contains a carbonate salt plus a sufficient amount of a soluble material selected from the group consisting of soluble cobalt salts and soluble mixed cobalt-molybdenum salts to provide the ions necessary to the formation of a desired electrodeposited coating of the selected metallic material.

Blast Cleaning

U. S. Patent 2,652,662. *Sept.* 22, 1953. *F. Newell, assignor to Pangborn Corp.*

A pressure blast machine for projecting a stream of soft abrasive particles, said machine comprising a tank for receiving and storing a quantity of said particles, the bottom portion of said tank forming a hopper in free communication with the upper portion of the tank and terminating in an outlet through which it moves said particles, a mixing chamber secured to said outlet for receiving said moved particles, said mixing chamber having a supply line opening therein for receiving a stream of fluid, under pressure, to impart a projecting force upon the particles received by the chamber, and a discharge opening for directing said particles and said stream of fluid, tank pressurizing structure connected for introducing fluid under pressure into said tank, said structure including agitating means within said tank for discharging at least one stream of fluid under pressure into said hopper to agitate the particles therein, and a pressure regulating valve connected in said line to hold substantially fixed the projection-imparting pressure and maintain it below the pressure at which fluid is introduced into the tank, to assure that the particles are uniformly discharged and do not jam in the bottom of the hopper.

Cleaning Machine

U. S. Patent 2,652,841. *Sept.* 22, 1953. *A. Kurt, assignor to Anlo, Inc.*

A cleaning mechanism including an enclosing framework, a chamber at one end of the framework for carrying a cleaning liquid, a separate chamber at the other end of the framework for carrying a rinsing liquid, means for heating said liquids, a conveyor for carrying the material to be cleaned through the framework above said chambers and means for separately forcing said liquids from their respective chambers at their respective ends of the framework through a plurality of continually oscillating nozzles with further means for shifting said nozzles while being oscillated through a multitude of continuously varying angles to produce widely shifting streams all over the material as it passes along on the conveyor.

Method of Pickling

U. S. Patent 2,653,115. *Sept.* 22, 1953. *R. M. Drews and H. L. Farling, assignors to Republic Steel Corp.*

The method of pickling a ferrous metal article which comprises the step of contacting the article at a temperature of about 300°F. with a pickling bath at a temperature between about 180°F. and about 210°F.

Pickling Zirconium

U. S. Patent 2,653,134. *Sept.* 22, 1953. *E. D. Dilling and G. L. Frederic, assignors to the United States of America.*

A process for removing scale from metallic articles of zirconium and its alloys that consists in subjecting the article to the action of a pickling bath consisting of about 3% by volume of 60% hydrofluoric acid, 3% by volume of 70% nitric acid, 93-94% by volume of water with about 3% by weight of lead nitrate, while maintaining free metalic lead in the bath, and maintaining such articles in contact with said bath until the scale is loosened and removable by washing.

and thereafter washing and rinsing the articles in water.

Method of Making Buffs

U. S. Patent 2,653,425. *Sept.* 29, 1953. *E. Sandman and E. R. Sykes, assignors to Eli Sandman Co.*

The method of making buffs comprising clamping a hub having a grooved periphery between a pair of axially movable rotary heads, rolling a length of pleated fabric on the combined heads in several layers, with the hub centrally located in the roll and transversely positioned therewithin, positioning a wire hoop over the heads and in the plane of the hub groove, crimping the wire down onto the roll and securing the same to the hub while flaring the ends of the roll, pressing the flared ends of the roll to bring the same into substantial parallelism with the hub, and securing the plies of the pleated fabric in this position.

Corrosion Inhibiting Packaging Material and Method of Making

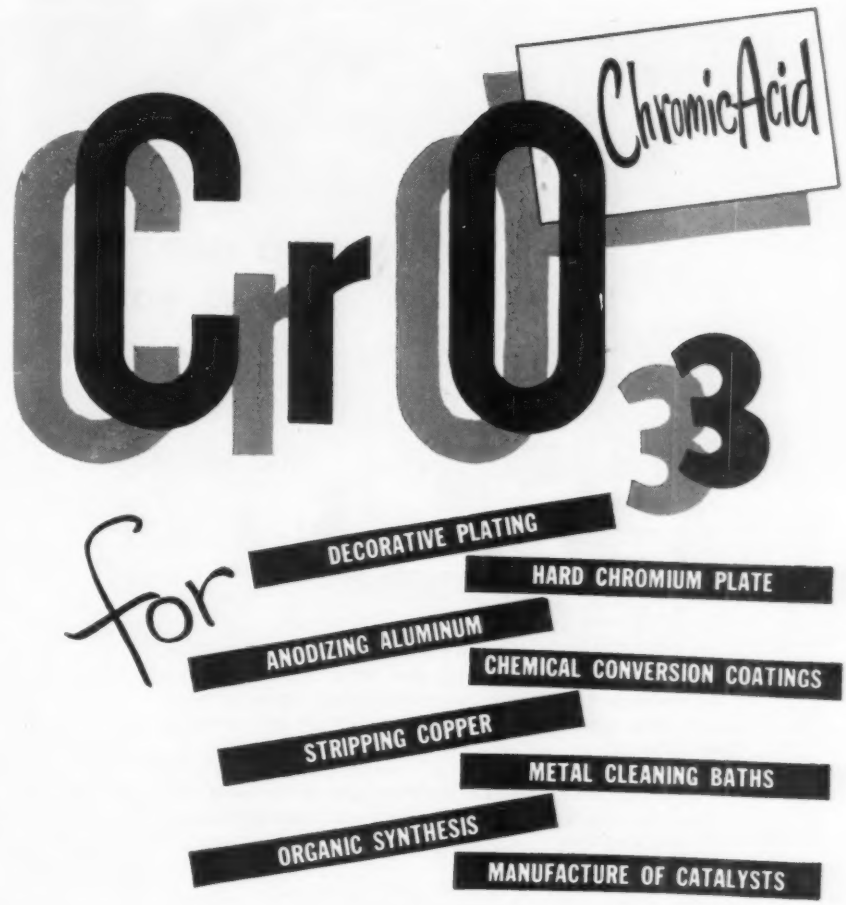
U. S. Patent 2,653,854. *Sept.* 9, 1953. *C. H. Schaar, assignor to The Cromwell Paper Co.*

A packaging material for inhibiting rusting and corrosion of metallic articles packaged therein, comprising a paper sheet having uniformly coated thereon an effective quantity of the reaction product of dicyclohexylamine and caprylic acid.

Plating Aluminum

U. S. Patent 2,654,701. *Oct.* 6, 1953. *E. R. Calderon and G. W. Slomin.*

A method of providing objects, composed essentially of aluminum, with a tenaciously adherent, fine grained alloy plating, comprising: etching the degreased surface of objects composed essentially of aluminum with an aqueous solution of alkali hydroxide and alkali fluoride and rinsing the etched surface; then treating the surface with diluted nitric acid and rinsing the surface; then forming a thin, adherent film of zinc on such treated surface; rinsing the activated surface and electroplating the activated surface with an aqueous strike solution containing cyanides of copper, zinc and a metal from the group consisting of silver, gold and indium, while imposing an electrical current upon the objects, said strike solution having a pH of between 9 and 10 and a surface tension below 45 dynes per square centimeter.



● The Mutual name and trade mark on a Chromic Acid drum guarantee a product with a minimum assay of 99.75% and a sulfate content not exceeding 0.1%. Chromic Acid of that purity may be used with confidence in any of the above applications.

MUTUAL CHEMICAL CO. OF AMERICA

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Plants: Baltimore - Jersey City

Bonding of Metal Carbonyl Deposits

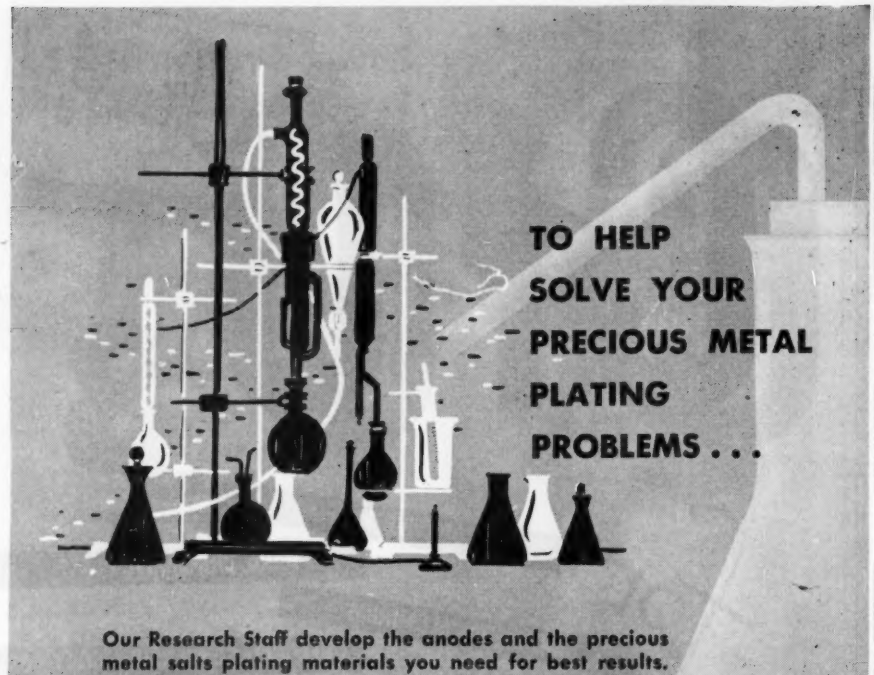
U. S. Patent 2,653,879. *Sept.* 29. 1953. *A. O. Fink, assignor to The Commonwealth Engineering Co. of Ohio.*

In a process for depositing a firmly adhering metal coating of predetermined thickness by the decomposition of nickel carbonyl on an aluminum base, the steps comprising first applying a thin porous nickel film to the clean metal base to a depth of between about 0.00005 inch to 0.00015 inch by contacting the aluminum base heated to a temperature in the range of 375°F. to 400°F. with a stream of gaseous nickel carbonyl diluted with a non-oxidizing gas, thereafter heating said thinly coated base to a temperature in the range of 500°F. to 1,200°F. while maintaining an atmosphere of CO_2 about the heated aluminum base, and then exposing said nickel coated aluminum base to nickel carbonyl gas while said base is heated to a temperature high enough to decompose said carbonyl gas and deposit a coating of nickel of the desired thickness.

Etching Aluminum Using Saccharic Acid as a Modifier

U. S. Patent 2,653,860. *Sept.* 29, 1953. *W. R. Meyer, assignor to Enthone, Inc.*

An aluminum-etching solution con-



Our Research Staff develop the anodes and the precious metal salts plating materials you need for best results. They also are available for consultation—to help minimize your costs or improve efficiency in your plating procedures.

We think of both as equally important services and APW welcomes requests for either one or for both. No charge for the technical service—we just want to be sure you use it—*freely*.

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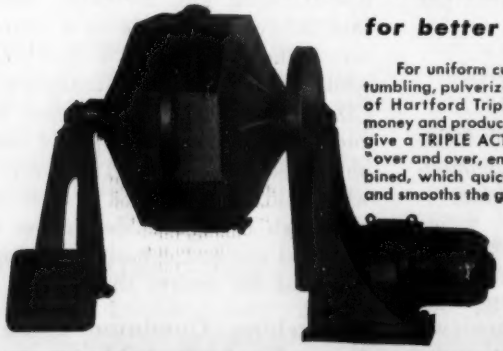

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sisting of water and from 0.5% to 35% by weight of the composition of claim 1.

The process of etching a metal article consisting principally of aluminum which includes the steps of cleaning the article, preparing the solution of claim 6, heating said solution to a temperature between 60° and 190°F., subjecting the article to said solution for a period from 5 to 3,600 seconds, and rinsing residual solution from the article.

Combination Steel and Die Casting Cleaning Process

U. S. Patent 2,653,883. *Sept.* 29, 1953. *J. A. Thomas, assignor to Ford Motor Co.*

The process of cleaning steel and die cast articles in a single container comprising filling said container with an aqueous base cleaning solution upon which is floated a layer of a water insoluble grease solvent, agitating one portion of the surface area of the container sufficiently vigorously to substantially completely dissipate the grease solvent layer over the agitated area and emulsify the grease solvent, immersing the die cast articles into the container through an unagitated area, removing the die cast articles and immersing and removing the steel articles only through the agitated area.

OBITUARY

ROBERT S. LEATHER

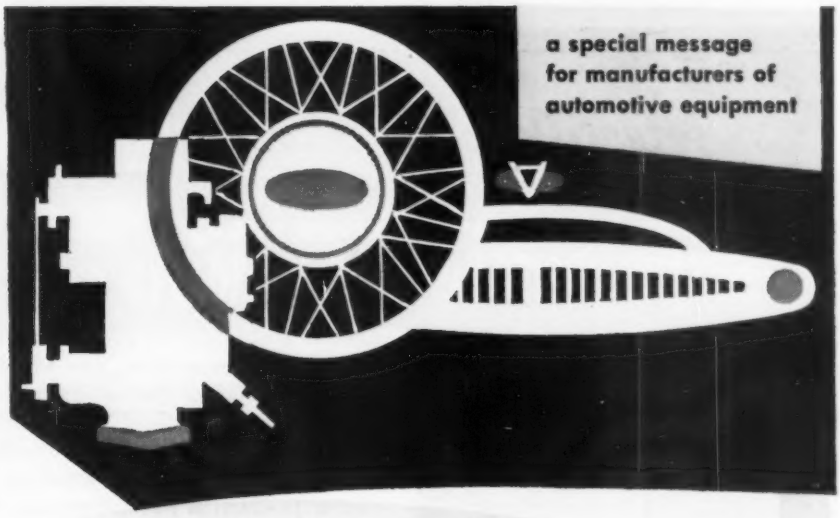
The Lea Manufacturing Co., Waterbury, Conn., announces with profound sorrow the sudden death on January 18th of its founder and chairman of the board, *Robert S. Leather*. President of the company for many years, Bob Leather, as he was known to a host of friends throughout the finishing division of industry and the metal working field generally, had just left New York with his wife, Laura and friends, Mr. & Mrs. Clyde Carthwaithe of Waterbury, for a long Mediterranean pleasure cruise. Three days out he had a sudden heart attack and passed away. Funeral services will be announced later pending return from the first port of call in Spain.

Since a young man, beginning shortly after World War I, Mr. Leather has been associated with finishing methods and materials. He was responsible for developing industry's first greaseless composition for finishing metal surfaces and from this came several successful new finishing methods, notably the Lea-Satin Finish. Mr. Leather saw the company grow from a small finishing compound and supply business with a few employees to an organization of four manufacturing plants with distribution all over the world and direct technical service throughout the United States and Canada.

Mr. Leather was one of the original founders and past president of *International Fellowship Club* now *Metal Finishing Suppliers' Association.* He was also an honorary lifetime member of the Waterbury Branch of the *American Electroplaters' Society.* Always one to whom the spiritual concept was most important, Bob Leather, a Mason, gave a large acreage of his big farm to a Benedictine Order of Nuns and later transferred more land and buildings at nominal cost to establish the Regina Laudis Abbey, Bethlehem, Conn. In fact, it was on this good deed, in large measure, that the highly praised movie "Come To The Stable" was based, starring Celeste Holm and Loretta Young.

In his younger days, Mr. Leather took part in many civic activities in and around Waterbury, never failing to respond when asked to head up some civic or charitable project. He retained his active interest in these projects until forced by a heart attack some years ago to ease up.

He is survived by his wife, Laura Lane Leather.



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AND IRIDITE IS EASY TO APPLY. Goes on at room temperature by dip, brush or spray. No electrolysis. No special equipment. No exhausts. No specially trained operators. Single dip for basic coatings. Double dip for dye colors. The protective Iridite coating is not a superimposed film, cannot flake, chip or peel.

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Recent Developments

New Methods, Materials and Equipment for the Metal Finishing Industries

New Design Sewed Buffing Wheel

W. J. Holtmeier, Inc., Dept. MF, 71 West 23rd St., New York, N. Y.

The above firm has introduced for national distribution a sewed buffing wheel section of unique construction which is claimed to outwear, outproduce, and hold compound better, than the conventional sewed or stitched buff.

The construction involves cutting the triangular segments on the bias, carefully laying them between two full discs, and then spirally sewing each section in either 3/8" or 1/4" sewing. These buffs, standardized in 18 ply and 30 ply and in the 14" and 16" diameters, give all the advantages of bias cutting in a full cloth buff and fill a void between the conventional sewed buff and the metal center ventilated type of air buff.

The Triangle bias buff has been job tested in the New York area for more than two years with most favorable results in production and economy of operation. Among the other features of this buff the overlapping construction of the bias cut triangular segments tends to hold compound better, contribute to the cooling effect, and and give a better cross cutting action. Centers are reinforced giving a harder packed buff. In general, this wheel is expected to replace conventional sewed buff on normal cutting and coloring operations where a heavy duty buff is required but where considerations of cost or production will not warrant the metal center ventilated type buff.

Electroplating Rectifiers

Wagner Brothers, Inc., Dept. MF, 400 Midland Ave., Detroit 3, Mich.

A versatile, new line of electroplating rectifiers has recently been developed to accommodate any application requiring a positive source of continuously smooth d.c. current, at capacities from 5 to 50,000 amperes.

They are available in five basic models: Large Package Unit, 2,000 to 50,000 amps.; Water Cooled, 1,500 to 50,000 amps.; Small Package Unit, 250 to 2,000 amps.; Cubicle, to 2,000 amps.; and Bench Type, 5 to 200 amps.

These rectifiers are conservatively rated, 3-phase circuit, selenium type rectifier stacks connected for 5% ripple, of unusually high efficiency and advanced design. Their compact, lightweight construction makes extra structural supports or foundations unnecessary. They can be connected in series, parallel, or series-parallel for practically any output of direct current power. All units are easily modified to meet your particular requirements. Photograph shows a typical unit.

Associated regulators and controls of various types are also obtainable in standard or special designs.

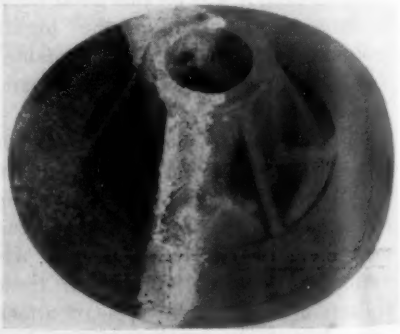
Phosphoric Acid Cleaners

Detrex Corporation, Dept. MF, Detroit 32, Mich.

A group of phosphoric acid-type cleaners intended mainly for products that are too large or heavy to be phosphate coated with normal production methods, and for manufacturers whose production does not warrant elaborate equipment for phosphate cleaning, has been developed.

Called the 800 Series, this latest addition to the family of phosphate cleaners rounds out the line, and makes the manufacturer the only producer with facilities to supply the complete needs for phosphate coating compounds, alkali and emulsion cleaners, and the equipment needed to use these cleaners efficiently.

L. C. Camel, sales manager for the firm's Chemical Processing Division, reported that the new 800 Series meets every government specification for this type of product. The cleaners can be applied by any practical method such as brush, sponge, dipping, or flowed-on, and can be specified to incorporate



In the above photograph a 12-month accumulation of rust and dirt was removed from this large casting.

such properties as detergency, oil solvency, rust and scale removal.

The phosphoric acid-type cleaners provide two important functions. In addition to removing rust, light scale, shop dirt and oil, as specified, it also deposits a fine-grained crystalline structure of iron phosphate that becomes chemically interlocked with the metal itself. This coating contains millions of microscopic crevices into which paint flows and is securely locked. The result is that peeling and flaking is retarded, corrosion is prevented, and blistering due to corrosive action taking place under the paint film is virtually eliminated.

The company states that ferrous metal products cleaned and coated with one of its phosphate cleaners present a smooth, uniform surface for the organic finish, increasing service life and eye appeal, and therefore becomes an important selling factor for the manufacturer.

Replacement for Acid Dips

Bell-Rae Chemical Co., Dept. MF, 6349 North Western Ave., Chicago 45, Ill.

A replacement for acid in the plating cycle has recently been announced by the above manufacturer. Called Kem-Bond, the new product is claimed to eliminate fumes and to help remove buffing and drawing compounds as well as rust, since it has a cleaning as well as a pickling action.

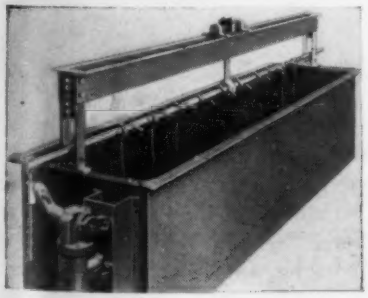
Additional information may be obtained by writing to the above address.

Cathode Rod Support for Plating Tank with Rod Agitator

Belke Mfg. Co., Dept. MF, 947 N. Cicero Ave., Chicago 51, Ill.

Sagging cathode rods are eliminated without loss of plating space by a new cathode rod support.

Developed for use with rod agitators, the support is carried by structural steel members positioned over the cathode rod and mounted on the ends of the tank. The members are mounted high to afford plenty of room for hooking racks on the cathode rod and taking them off.



One end of the support is attached to the cathode rod in a fixed position; the other end is equipped with a grooved roller which runs on a short rod mounted on the structural members.

In operation, the support moves with the cathode rod, permitting racks to be properly spaced for full utilization of the plating tank. Furnished in sizes for all requirements.

Control of Caustic Black Solutions

The Foxboro Company, Dept. MF, Foxboro, Mass.

A one-instrument control system which automatically maintains the correct temperature and concentration of blackening bath solutions has been engineered by the above manufacturer of industrial process instrumentation.

The instrument, a duplex temperature controller with two setting indexes, operates two control valves —

for SAFE PRODUCT and EQUIPMENT PROTECTION against Chemical Reagents & Abrasion use CYCLOFLEX PC-11 PLASTISOL COATINGS

Heat Converted for Long Service —

Chemical resistance to a variety of reagents permits the use of PC-11 on many acid bath containers, on acid handling equipment and on many products that are subject to various acid fumes, sprays, etc. At the same time its high tensile strength makes it resistant to rough handling, making it practical for use where abrasive resistance and a flexible coating are needed, — such as on conveyor rolls, shock mountings, etc.

PC-11 requires only one primer coat and one finish coat for a tough, rugged, scuff-resistant, permanently flexible insulation.

Because it is 100% solids, PC-11 coats more surface per gallon thus reducing costs—and produces a coating from 1/16" to 1", as may be desired.

Our engineers will be glad to give you complete information and recommendations about the use of PC-11 on your products and equipment. Mail the coupon.

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one governing the flow of dilution water to the bath and the other regulating the flow of fuel to the burners.

Concentration control is necessary because continuous boiling causes the water in the solution to evaporate, leaving a higher concentration of salt and elevating the boiling point. The controller, sensing this higher temperature, operates the dilution water valve to keep the boiling point (and hence the concentration) at the desired value. Uniform depth of surface finish is assured and rejects cut to a minimum.

Under normal work loads and frequency, fuel needs are satisfied by a fixed setting of a by-pass valve in the fuel line. However, on start-ups and during production peaks, the instrument automatically controls the fuel valve, permitting more heat without hazardous boil-over or waste of fuel.

Both electric and pneumatic control systems are available. Application engineering data will be sent on request.

Cartridge-Type De-Ionizer

Illinois Water Treatment Co., Dept. MF, Rockford, Ill.

A cartridge-type de-ionizer to produce solids-free water at the rate of five gallons per hour is announced. Two models of the "ionXchanger" are offered — the Research Model for producing water comparable to triple

distilled, and the Universal Model for single distilled. No electrical controls are required. Mixed resins change color as exchange capacity of unit becomes exhausted. Units are easily replaced in a matter of seconds, and can be mounted on laboratory test stands or in permanent bracket.

50 Amp. Regulated Power Supply

Perkin Engineering Corp., Dept. MF, 345 Kansas St., El Segundo, Cal.

The above manufacturer recently announced its new model MR-1032-50, rated at 10-32 volts DC at 50 amperes continuously with magnetic amplifier regulation of ± 1%.

The unique features of this power supply are that the magnetic amplifier regulation is from 0-50 amperes over the DC voltage range of 10-32 volts and for the AC input voltage range of 220 volts ± 10%.

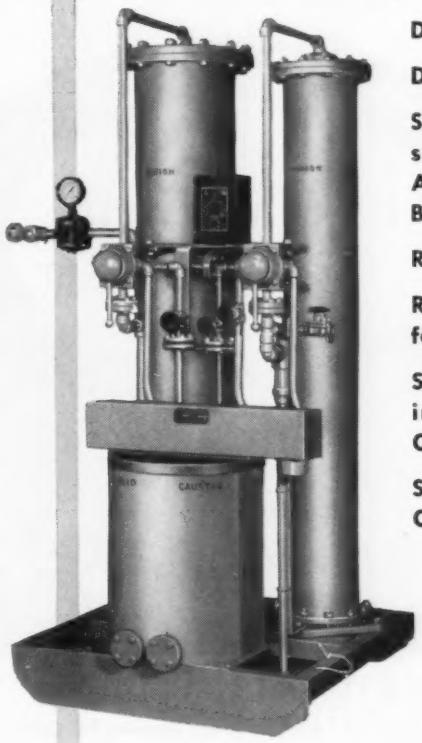
The ripple of this unit is 1% rms. maximum and the recovery time is 1/10 second. The unit is provided with 4½" ammeter and voltmeter and its overall dimensions are 22" wide x 18" deep x 42" high.

Precision Hard Chrome Plating Unit

Wagner Bros., Inc., Dept. MF, 418 Midland Ave., Detroit 3, Mich.

The exclusive features of the Morey process for precision hard (industrial) chrome plating have now been made available to general industry. All equipment needed for a complete hard chrome department is furnished: six tanks, lead and Neoprene tank linings, five rectifiers, a fume separation system, heat and timing controls and electrical connections ready for immedi-

PRACTICAL APPLICATIONS OF ION EXCHANGE



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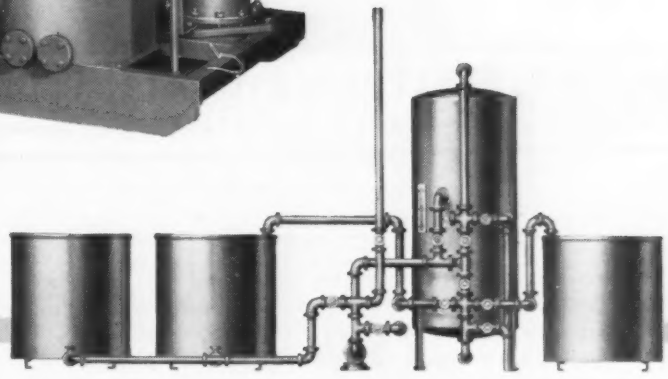
Selective Removal of Troublesome Constituents from Chromic Acid, Plating and Anodizing Baths

Recovery of Valuable Metals

Removal and Recovery of Offending Ions in Waste Waters

Selective Removal of Contaminants from Chromic Acid Copper Stripping Solution

Substitution of Anions and Cations in Solutions



Get Details from INDUSTRIAL

The success stories of ion exchange are not isolated cases. All through industry in a wide variety of applications, ion exchange is effecting substantial cuts in costs, more uniform products, and a new ease in process control.

Here are a few suggestions for you to check against your own processing. INDUSTRIAL is glad to give you the benefit of its experience if you will outline your requirements. An estimate of probable savings, production, approximate costs, and the equipment required will enable you to know what ion exchange can do for you.

4946

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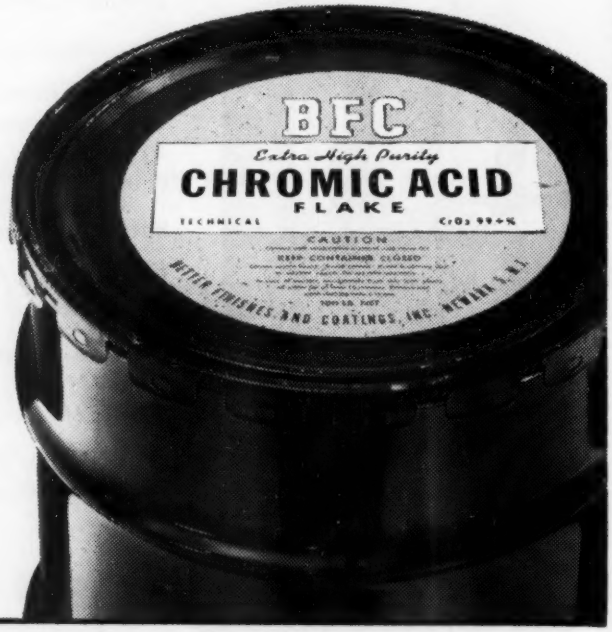
Do we ever make a batch of Chromic Acid less than 99.7+% pure? Every so often we do. But when that happens, right out on the dump it goes —and good riddance.
The top label says "Extra High Quality" and that's what every drum contains. We think you'll like the uniform quality of our product and the way we make good on our promises. When you're in the market, why not call us?



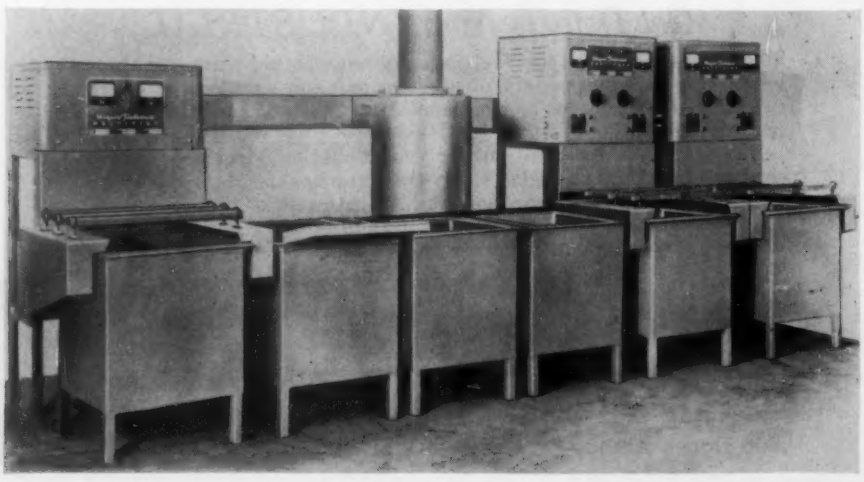
99.7+% Pure
Consistently low in chlorides, sulphate and insolubles. More than meets every requirement of the electroplating industry, as well as U. S. Government Specification AN-A-21 and Federal Spec. OC-303.

BFC PAINTS · PLASTICS · CHEMICALS

BETTER FINISHES & COATINGS, INC.
268 Doremus Avenue, Newark 5, N. J. • 122 East 7th St., Los Angeles 14, Calif.

ate installation. An intensive course of instruction in the advanced phases of precision plating is offered as a part of the process.

Based on the Morey Process, this equipment is said to accomplish extremely precise deposition of chrome plate.



Joseph Wagner, president, says, "Our new industrial chroming unit will plate with exact duplication of original finish, in deep threads or to the keenest cutting edge. It produces a surface harder than any existing plating method to prolong tool life up to 1000%."

Exclusive features of this equipment cited by the manufacturer are:

1. An automatic electric heat control and timing system which assures precision of plate deposition and makes grinding and lapping to size unnecessary.
2. Individually controlled rectifiers which permit two separate jobs to be plated at once, in the same tank.
3. A built-in air purifying unit which removes harmful chemical fumes from the plant atmosphere and brings in clean air.
4. A special, long-life solution with an exclusive catalyst.

The company offers to plate any reasonably sized sample without obligation in support of its claims.

Lead Plated Electrical Enclosures

Trumbull Components Dept. General Electric Co., Dept. MF, Plainville, Conn.

Installation showing Trumbull HCI Safety Switch in new lead-plated sheet steel enclosure.

Lead-plated, sheet-steel enclosures for safety switches and circuit breakers — an innovation in the electrical industry — are being produced by the company. These new enclosures are designed for outdoor use and other special applications where cast-iron enclosures were previously used.

These new enclosures will find wide applications where humid, dust-laden and corrosive atmospheres prevail.

According to test data, the inert lead coating, unlike cast-iron surfaces, effectively resists the corrosive effect of acid, alkali and salt spray.

Lead-plated enclosures are much lighter than cast-iron types and, therefore, are much easier to handle and install.

Industrial Prophylactic Hand Cream

The Chase Chemical Co., Dept. MF, 1374 East 170th St., Cleveland 10, O.

A prophylactic hand cream called Donovo for industrial use successfully combats the skin-drying and cracking effect of kerosene-base waterless hand cleaners, and strong detergent-type hand cleaners broadly used in industry. The new hand cream helps prevent the drying out of skin, and assists in restoration of depleted oils in situations where the skin is chapped and irritated.

The new product contains 15% hydrous lanolin and U.S.P. menthol in in a hydrophilic cream base. In local tests in Cleveland industrial plants, it has shown a therapeutic value in correcting dry and rough skin, and skin irritation conditions of occupational origin.

As workers are accustomed to washing their hands at lunch time and at the end of their shift, the continued use of waterless hand cleaners, naphtha solvents and similar harsh dirt removers, rapidly deplete the skin of its natural fatty substances. Unless corrected, this causes the skin to dry out and crack.

By applying the cream twice daily, at lunchtime and at the end of the day's work, the skin-oil balance is restored. Used in this fashion, the lanolin content restores and maintains the skin-oils, in effect affording a preventive skin care program. The menthol affords comfort due to its cooling astringent action on the skin.

The cream is available for industrial use in 1¾-ounce and 8-ounce jars, which usually provide a 30 to 60-day supply. Further information, or a 1¾-ounce test sample, may be obtained by writing to the above company.

Vacuum Metallizing Unit

High Vacuum Equipment Corporation, Dept. MF, Hingham, Mass.

The above manufacturer announces the development of the first commercial high vacuum metallizing unit specifically designed to handle gold, silver, copper and aluminum coatings on a completely interchangeable production basis with equal efficiency.

The new unit features a readily removable interior mechanism constructed as shown in the attached drawing. The metal to be evaporated is held in resistance-heated "boats" on the stationary rods running through the axis of the cylindrical chamber. Silver, gold, copper or aluminum which is evaporated from the "boats" disperses in an upward direction through an arc of 60° to 90°. The pieces to be coated are attached to the six "riser rods" or work stations. As this entire mechanism is rotated, each of the six work stations are successively passed through the arc of evaporating metal and the work is coated. To se-

COMPACT • PORTABLE • AUTOMATIC

Sel-Rex JET PLATER

A COMPLETE PLATING UNIT

Consisting of

- **RECTIFIER with automatic timer**
- **TANK**
- **FILTER**
- **PUMP**
- **AGITATION**
- **TEMPERATURE CONTROL**

Designed for high speed, mass production precious metal plating or for use in the laboratory for any small-volume alkaline plating bath. Also ideal for use with a portable plating barrel. The JET-PLATER is equipped with a stainless steel tank but can be furnished with a rubber-lined or koroseal tank for acid plating solutions.

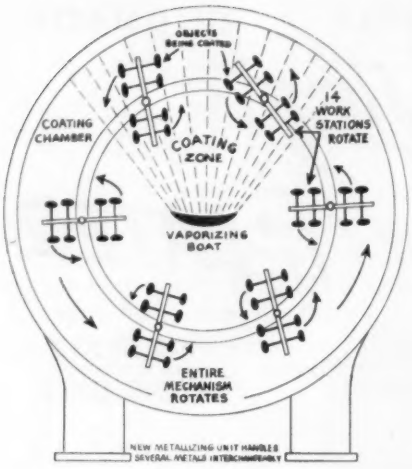
Standard models — 10, 20, 30 gallon tanks. Larger sizes up to 100 gallons furnished to your specifications.

Complete details on request.

SEL-REX PRECIOUS METALS, INC.

Dept. MF-3, 229 Main Street · Belleville 9, N. J.

Pioneers and developers of better gold, silver, nickel, copper, cadmium and rhodium salts and solutions.



cure uniform and complete coverage of the work, each riser rod is also rotated independently on its own axis, thus turning all sides of each piece toward the source of evaporating metal.

Prior to the development of this new rotating unit, only aluminum could be used efficiently for commercial mass production coating. Aluminum can be hung in clip form on ordinary resistance-type filaments without dropping off when heated because in the molten state it has the peculiar property of "wetting" the filament and clinging to it. Mounted in the center of the coating chamber the evaporating aluminum disperses equally in all directions, coating all work pieces in every part of the chamber. It is then only necessary to rotate the work stations on their own axes to secure uniform coating coverage of the pieces.

Gold and silver and copper, unlike aluminum, do not "wet" the resistance element and tend to drop off. Therefore these materials must be evaporated from molybdenum or tantalum "boats." When so held, the evaporating metal can disperse only in an upward direction. This means that only the work directly above the "boat" can be coated. Therefore only a fraction of the capacity of the chamber can be utilized unless the new rotating mechanism is used.

Dark areas or spotty coating caused by molten aluminum dropping onto the work are completely eliminated by this new design since metal is held in "boats."

For many applications silver, copper or gold is preferable coating material rather than aluminum. Silver, for example, when combined with lacquer and a dye, results in a better "gold" effect for jewelry and similar applications. However, until the development of this new unit, aluminum has been the only feasible material for commercial production coating.

Dust Collector

American Air Filter Co., Inc., Dept. MF, Louisville, Ky.

The newly developed Amerjet dust collector is a reverse jet fabric collector designed for those applications where extremely fine particles are involved or where the material must be collected in a dry state for reclaiming.

The cleaning media is automatically reconditioned by a jet of high pressure air forced through the cloth in opposite direction to the flow of the air being cleaned. Because the cleaning cycle is continuous, the collector maintains a constant pressure drop and thus a steady air volume at the exhaust points.

This method of media reconditioning also permits much higher velocities through the cleaning tubes. Therefore, less filter cloth is needed for any given cfm than is required by conventional cloth envelope or bag type

The Masters Electro-Plating Association, Inc.

59 East Fourth Street, New York 3, N. Y.

Is Proud to Announce Its

36th Annual Banquet and Entertainment

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Saturday, May 8, 1954

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Starlight Roof of the Waldorf Astoria

New York City

Cocktails 6:30 P.M. Banquet 8:30 P.M.

Subscriptions $25.00 per Person

collectors. The size of the dust collectors needed is thus materially reduced.

All-Vinyl Gloves

Houghton Laboratories, Inc., Dept. MF, Olean, N. Y.

A new type of glove of all-vinyl plastic has been developed and is now being manufactured by the above firm. The Hyflex No. 340 gloves provide outstanding resistance to almost all acids, oils, resins and alkali solutions and are adversely affected only by a limited number of solvents.

Manufactured under rigid laboratory control, every pair of gloves is factory tested for freedom from pinholes guaranteeing complete protection. They are available in a complete range of sizes for both men and women.

Improved Line of Tote Boxes

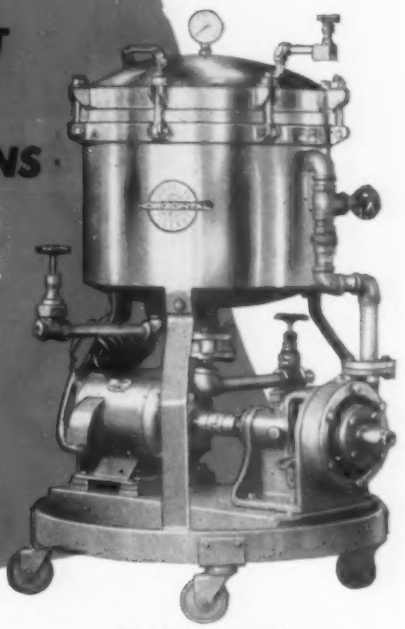
Industrial Bench & Equipment Mfg. Co., Dept. MF, 98 South St., New Britain, Conn.

With the expanded facilities recently installed in their plant the above company has redeveloped the line of tote boxes purchased from the New Britain Machine Co., Shop Equipment Division.

The stacking type tote box as illustrated, is among the most popular styles to be improved. Now, all welds are guaranteed indefinitely. The box is made stronger, of a heavier gauge steel, sturdy, durable and compact. The handles are of pressed steel, folded double to afford a comfortable handhold. Holes are punched to permit the use of hooks. Drop handles can also be furnished. The "Industrial" type

FOR LOW COST FILTERING OF PLATING SOLUTIONS

SPARKLER HORIZONTAL PLATE FILTERS



Sparkler Plating Filter
Model 18-D-6 Alliron
600 G.P.H. Portable

HERE'S HOW

★ On a horizontal filter plate it is possible to apply a thin pre-coat with about one-third the filter aid, and in one-third the time required for pre-coating a non rigid media or a surface in a vertical position. This saves time and filter aid.

★ With the Sparkler horizontal plate you can apply this thin pre-coat evenly over the entire plate surface and start filtering immediately with less pressure and obtain maximum consistant clarity right from the start up to the end of the cycle.

★ A filter cake on a horizontal plate will not crack, slip or fall off even with varying pressure or a complete shut-down of the filter. No pre-coat renewal is ever required after an interruption in operation.

★ When it is necessary to clean the filter, the Sparkler filter tank can be emptied in a matter of minutes with a minimum of loss of valuable plating solution.

★ Any grade of filter paper from fine to coarse can be used in a Sparkler filter. This makes it ideal for carbon treatment of solutions. Carbon mixed with water in a stand-by tank is circulated through a clean set of filter paper on the plates until a carbon cake is formed. The solution requiring carbon treatment is then circulated through the carbon beds without contaminating the plating tank or a shutdown of plating operations.

★ At the end of the cycle with a Sparkler filter you can blow-down with air and produce a relatively dry cake that can be disposed of in a trash can rather than washing it down the drain with attendant sewer clogging problems.

★ You will find your Sparkler plating filter positive and dependable from a standpoint of uniform high quality filtering and economical in labor and material.

SPARKLER

Sparkler representatives in all principal cities are ready to give you personal service on your filtering problems, and show how you can make a material saving in operating cost.

MANUFACTURING COMPANY
Mundelein, Illinois

Sparkler International Ltd.
Prinsengracht 876, Amsterdam, Holland

Sparkler Western Hemisphere Corp.
Mundelein, Ill. U.S.A.

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products
Technic Potassium Gold Cyanides Concentrated Aqueous and Dry
Technic Alloys for the Production of all Decorative Shades
Technic Rhodium Concentrates for Heavy and Decorative Plating
Technic Immersion Tin for Fast Non Electrolytic Tinning of Brass and Copper
Technic Protectox-Antitarnish Treatment for Precious Metal and Copper Surfaces
Technic Flame Flux for Hard Soldering without Oxidation
Plating Equipment and Rectifiers for all Specialized Requirements
services
Custom Designed Controls
Custom Developed Solutions
Custom Designed Equipment
Custom Consulting & Laboratory Service
Custom Engineering & Analytical Service
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Technic Inc. researches and develops methods and products for metal processing and finishing. We do not process or finish metals ourselves, but as consultants and suppliers we enable our patrons to perform these operations more efficiently and economically. Among the operations we can equip you to do better at lower cost are:
Controlled Color Gold Plating
Controlled Barrel Gold Plating
Controlled Heavy Gold Plating
Controlled Specification Gold Plating
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THE LARGEST ENTERPRISE OF ITS KIND IN THE WORLD

D-2 Stacking Tote Box is 20″ long, 12″ wide, 6″ high and weighs only 13 pounds. The D-4 Stacking Box is made of 18 gauge, 16″ long, 10″ wide and 5″ high and weighs 11 pounds.

Zinc Purifier

Scenta Products Co., Dept. MF, 521 South Fountain Ave., Springfield, O.

A new zinc purifier solution for use in precipitating contaminating metals in zinc electrolytic solutions is economically priced and available for prompt shipment. A liquid, highly concentrated, it may be used in small lots daily to avoid trouble from contaminants. Free samples are available to interested platers.

New Silicate Cleaners

Philadelphia Quartz Co., Dept. MF, Public Ledger Bldg., Philadelphia 6, Pa.

The company announces the addition of two new products to its line of soluble silicates — anhydrous sodium metasilicate and sodium orthosilicate, known as Metso Anhydrous and Metso 200.

Metso Anhydrous is technically pure anhydrous sodium metasilicate (Na_2SiO_3). It is a strongly alkaline detergent used for heavy-duty cleaning in the metal industries and for formulating specialized detergent compounds.

Metso 200, highly concentrated sodium orthosilicate, is designed for cleaning operations that require extra strong alkaline activity. It is suggested for the cleaning of ferrous metals prior to electroplating and enameling as well as for soak tank cleaning. Descriptive leaflets on both products are available from the manufacturer.

Emulsion Cleaners

Turco Products, Inc., Dept. MF, 6135 South Central Ave., Los Angeles 1, Cal.

Development of a complete line of seven emulsion cleaners was announced recently by the above manufacturers of industrial chemical processing compounds.

Materials included in the emulsion cleaner line are:

1. Airmulso: Noncrazing, nonstaining, light-duty material, especially suited for washing aircraft surfaces.
2. Mulsine: Medium-duty material, for years a standard material in the automotive industry.
3. Mulsirex: All-purpose emulsion cleaner. Offers equal efficiency whether used as a maintenance tool or as a cleaning agent in industrial spray washing machines.
4. Emulsit: Acid-stable emulsion cleaner. Especially designed for precleaning prior to spray-on acid cleaning, without any need of a rinse between the two applications. Excellent material for cleaning railroad car exteriors.
5. Turco-Klene: Heavy-duty emulsion cleaner. Offers highest penetrating power and solvency available in an emulsion cleaner.
6. Emulsoil: Heaviest-duty spray-on emulsion cleaner. Removes asphaltic soils, heavy grease, crater compound and other soils usually associated with tank cleaning. Ideal for the construction, petroleum and mining industries.
7. Borzin: Dip tank, extra-heavy-duty emulsion cleaner. Removes heavy grease, bituminous materials, paraffin waxes, gilsonite coatings and a host of other heavy soils.

Complete literature on this new emulsion cleaner line is available from the company upon request. Included in the literature (A-106) is an "Emulsion Cleaner Reference Chart," which includes specific industrial uses, maximum and minimum dilution ratios, diluents used, methods of application, flash points and safety factors of each of the emulsion cleaners discussed.

New Invention Provides Quick, Low Cost Test for "Free" Cyanide

The Universal Plating & Novelty Co., Inc., Dept. MF, 348 West 36th St., New York 18, N. Y.

A patent-applied-for simple device for determining the approximate "free" cyanide concentration of "high-speed" copper plating solutions is now being marketed.

The test is made by immersing a special alloy "Pencil" in the bath for 15 seconds. If the pencil becomes copper coated, "free" cyanide is too low. If it becomes brass colored, "free" cyanide is in a safe working range. If pencil retains clean appearance, "free" cyanide is too high.

The pencil can be used for several hundred tests and is economically priced. It is made ready for the test by sharpening in any automatic pencil sharpener; no further surface preparation is necessary. The pencil comes in an attractive vinyl pocket protector case, and refills are available at a discount.

Corrosion Preventive

R. M. Hollingshead Corp., Dept. MF, Camden, N. J.

Improved high-temperature characteristics and extended protection are said to be the features of an improved fingerprint remover. The product, Klad Kote 356, originally was developed to conform to military specification MIL C 15074A, but now is reported to exceed that specification by a wide margin.

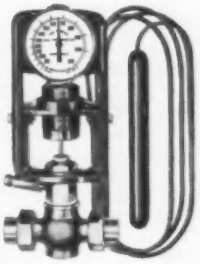
The improved formula is said to have a flash point 140° higher than the military specification for which it was originally compounded and, also, is reported to exceed minimum humidity cabinet 7 day qualification tests by 23 additional days. The company claims that the product's 240° flash point and 30 day protective features are the highest yet attained for a product of this kind.

As a result of its formula improvements, it is claimed that it is unnecessary to use a slushing oil for interplant protection in addition to a fingerprint remover. The protective levels afforded by the new material, in addition to its cleaning characteristics, the manufacturer says, are sufficiently high to satisfy most manufacturing requirements for inter-shop protection.

Used by Leaders in the Plating Industry

Cut Cost of METAL FINISHING With POWERS

NEW Temperature REGULATOR



For Plating, Anodizing, Bonderizing, Pickling, Cleaning, Rinsing, and Chromate Dips. Powers No. 11-MF Regulators will help you get the most effective use from various solutions by holding them at the right temperature automatically.

Plastic Covered Thermal Bulb and Tubing—is highly resistant to solutions in above processes. Prevents electrical shorts. No insulators required for the regulator.

Easy to Read 4" Dial Thermometer—indicates temperature of liquid being controlled and makes it easy to adjust regulator for different temperatures.

Bulletin 330 describes this simple, dependable control.

THE POWERS REGULATOR CO., SKOKIE, ILL.
Offices in over 50 Cities, see your Phone Book (b51r)

Over 60 Years of Automatic Temperature and Humidity Control

Special Demineralizer

Penfield Mfg. Co., Inc., Dept. MF, 19 High School Ave., Meriden, Conn.

The above pictures shows a Penfield demineralizer equipped with special controls which enable the automatic maintenance of storage tank water supplies at a definite known purity standard.

After the regeneration cycle has been completed and is in its final rinse stage, the operator switches on the unit's automatic controls which then perform all required functions completely automatically, including signaling when another regeneration cycle is needed.

Once these automatic controls take over, the effluent continues to run to drain until a desired preset conductivity (purity) has been reached. At this time, the super high purity water being produced starts to flow to the storage tank and continues to so flow until the storage tank is filled.

When storage tank level falls to a predetermined level, the demineralizer automatically starts another delivery cycle, allowing only water of the preset purity standard to reach the storage tank and automatically turning off when the storage tank has been refilled.

Should the purity drop while the storage tank is being filled, the unit automatically runs to drain and, in the event proper conductivity does not

Wheels CUT FASTER, LAST LONGER

When treated with Park KOLD-GRIP POLISHING WHEEL CEMENT

KOLD-GRIP Polishing Wheel Cement, laboratory-controlled through every step of production, will arrive at your plant *ready for use!* Viscosity is constant, regardless of normal temperature variations and the cement can be applied directly from the container . . . *without mixing or heating.* Kold-Grip is clean, odorless and very easy to handle.

Coarse or fine-grain abrasives set up right for fast cutting efficiency. Substantial savings are effected through longer over-all wheel life, fewer set-ups and reduced wheel inventory.

Wheels dry rapidly, are unaffected by humidity changes, and may be stored in any convenient plant area.

Let our polishing engineer demonstrate Kold-Grip for you, or send for free sample, telling us the metal to be polished, grain sizes to be used, and drying facilities available. We can help you if we hear from you.

• Liquid and Solid Carburizers • Cyanide, Neutral, and High Speed Steel Salts • Coke • Lead Pot Carbon • Charcoal • No Carb • Carbon Preventer • Quenching and Tempering Oils • Drawing Salts • Metal Cleaners • Kold-Grip Polishing Wheel Cement

LICENSED MANUFACTURER: Electric Resistance Furnace Co., Ltd., Wythenshawe, Surrey, England

Park CHEMICAL COMPANY 8075 Military Detroit 4, Mich.

LETTER TO THE EDITOR

Mr. Nathaniel Hall, Editor
METAL FINISHING
381 Broadway
Westwood, New Jersey

Dear Mr. Hall:

I fear many of your readers may get the wrong impression of the relative merits of vacuum metallizing and electroplating as a result of the article by Isidore Cross in your December issue, entitled "Vacuum Metallizing and Plating — A Comparison."

The general tone of his article suggests that vacuum metallizing produces a gaudy but perishable product and that electroplaters should stick to their plating, particularly when a quality product is desired.

His objective in writing this article (and yours in publishing it) is certainly commendable, for many electroplaters today are seriously considering the addition of vacuum metallizing equipment to their facilities, in order to broaden their services and to hold the business of their present customers who may be exploring this new finishing process.

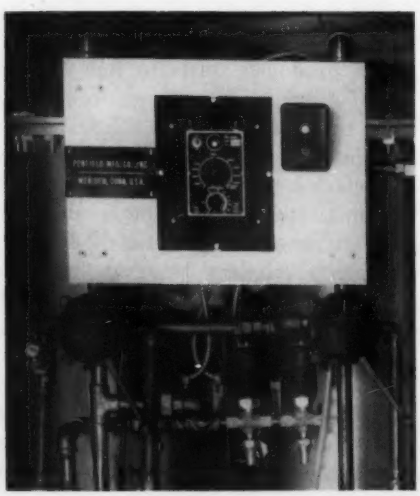
However, certain conclusions which Mr. Cross draws in his article suggest that if he is not hopelessly prejudiced in favor of plating, he is at least not thoroughly informed about some of the latest developments in the technique of vacuum metallizing. That is why I feel it may be of service to your readers to amplify some of the points in Mr. Cross' presentation, so that they may arrive at a more accurate evaluation of the two techniques.

Let me deal with these points in the order in which they appear in the text:

First off, no one — least of all, the manufacturers of vacuum equipment — has ever claimed that vacuum metallizing will replace electroplating. Each process has applications for which it is the more suitable and economical method.

I do not think Mr. Cross is justified in suggesting (on page 59) that the organic coatings which must be applied as an undercoat and as a protective topcoat present a limitation to the use of vacuum metallizing. Recent developments by lacquer manufactures in organic coatings have so improved the wearing qualities of these materials that the final finish obtainable by va-

come back within 27 minutes, the unit will automatically stop and signal lights.



As is obvious from the above, these controls enable all operations except regeneration to be accomplished without the presence of an attendant. Labor costs are cut to a minimum and the purity of the water reaching the storage tank is an automatic certainty.

Regeneration of the unit is accomplished by the customary "ion-exchange-in-reverse" process of "washing" the cation resins with an acid solution and the anion resins with a caustic solution to return the resins to their original active ion exchange state. Such regeneration cycles can be accomplished in under one hour whenever the unit automatically signals that they are needed (i.e., that the resins have become "saturated" with the mineral impurities they have been extracting from the raw water).

cuum metallizing now compares very favorably with electroplating in most instances.

A vacuum metallized finish protected by a topcoat of one of the new lacquers now available will outlast the best chrome plating obtainable today, measured by all standard salt-spray and humidity tests. Vacuum metallized zinc die castings have successfully withstood 800 hours of salt-spray exposure, whereas most commercial chrome plating begins to break down after about 35 hours.

As to the lacquers used for the undercoating: properly cured, they will resist outgassing so that there is no difficulty in evacuating the chamber and its load of product to the low pressure required for vaporizing the metal to be deposited.

While it is true that vacuum metallizing of individual pieces is always done in batches and so (as Mr. Cross puts it on page 61) "must be considered a rack job," fairly good-sized batches (for example, 300 trumpets or 1,000 bicycle horns) can be accommodated in the new 72-inch diameter chambers which have recently been introduced by our company. Moreover, the duration of the entire metallizing cycle has been reduced to as little as 15 minutes by providing pumping equipment designed with capacity for rapid pump-down. Hence, virtually continuous production prevails, since a second rack-load of pieces is loaded into the chamber in a matter of seconds after the finished load is removed.

Two base coats of lacquer are not always required for metallizing castings; one usually suffices nowadays. Heavier solids content of the newer lacquers fills in, seals, and provides the necessary gloss with a single coat. Only in the case of poor quality castings, such as those made in rubber molds (costume jewelry, for example), are two base coats sometimes required.

The discussion of the relative merits of the two methods in terms of requirements of a hypothetical costume jewelry manufacturer (on pages 62-63) is irrelevant, it seems to me. Mr. Cross himself admits that the customer will end up wanting "a Tiffany finish at a dime-store price" and at this stage, as he says, "it's much cheaper to turn out the vacuum metallized item."

The truth is, for a particular grade or quality of finish, the choice between the two methods is quite easily made. It is very misleading, therefore, for Mr. Cross, on page 63, to state baldly: "A good plating and polishing job is much superior to vacuum metallizing." In what way? In wear-resistance? The organic finishes applied to protect a plated surface are all air-dried lacquers which wear off quite quickly. The baked synthetic finishes used to protect vacuum metallized surfaces today wear much longer. Only in applications where wear is very severe — such as the bumpers on automobiles — can electroplating be considered superior in wearing qualities to vacuum metallizing.

In appearance? The author admits there is not much difference between the two finishes, and that plated parts with intricate contours cannot be buffed to give a luster as good as that obtainable by vacuum metallizing.

For bulk finished pieces? Vacuum metallizing will always give a better appearance than plating, and in this respect is certainly not inferior in quality.

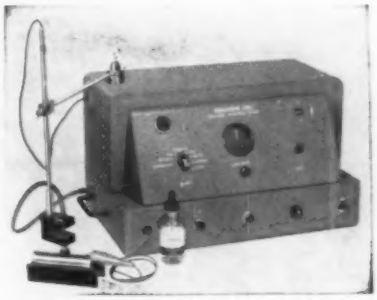
The truth is that the electroplater who is weighing the merits of vacuum metallizing need not even consider whether it is a better or poorer process than electroplating. What he needs to consider is whether he can force his customers to pay the price for plating certain jobs where vacuum metallizing advantages are clearly indicated.

I sincerely hope that this amplification of Mr. Cross' article will help your readers arrive at a better and

test the thickness of plating . . .

- **Quickly**
- **Accurately**
- **Simply**

with the



KOCOUR Electronic Thickness Tester

It's no longer necessary to spend many hours of laboratory time to determine the thickness of plating. You can test the thickness of all the commonly deposited metals on various base metals and materials in approximately a minute with an accuracy of 90-95%. No highly skilled technicians are required to operate the instrument because . . . operation is virtually auomatic . . . readings are direct . . . no calculations, no graphs, no charts, no standards to contend with.

The KOCOUR ELECTRONIC THICKNESS TESTER is being used to make thousands of thickness tests daily. Companies ranging from the small job shops to large industrials are solving hundreds of thickness testing problems daily with the consistently accurate results they can depend on.

Investigate today! See how the Kocour Electronic Thickness Tester can solve your problem. We guarantee satisfacion.

Write for literature. No cost . . . no obligation.

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4802 S. St. Louis Ave.
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• *Pioneers & Specialists in Test Sets & Instruments for the electroplating industry since 1923.*

Specify **KOCOUR TEST SETS** *from your supplier.*

A Greaseless Compound that Counts

Count On SPEEDIE SATIN FINISH Every Time!

There must be a reason! Sales of SPEEDIE Satin Finish are going up, Up, UP! . . . by the proverbial leaps and bounds. What's the reason? SPEEDIE Satin Finish really *sticks* to the wheel — giving a finish that is unmatched. Here's one way to save money on *your* greaseless . . . and you'll *like* to use SPEEDIE Satin Finish — because it is *colored red,* enabling the buffer to know at all times how much compound he has on his wheel . . . a second SPEEDIE method of saving you dollars.

SPEEDIE Satin Finish is available in all size grits, from No. 80 for polishing, through No. 400 for the finest finish. Here is a uniform product well worth investigating.

Write today for samples of SPEEDIE Satin Finish, advising grit size and number of tubes required. And inquire about the complete line of efficient and economical SPEEDIE Buffing & Polishing Compositions.

Polishing Room Supplies and Equipment

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more accurate evaluation of vacuum metallizing with respect to electroplating and the finishing industry.

Very truly yours,
F. J. Stokes Machine Company,
J. Gordon Seiter, Manager
Vacuum Metallizing Department

NEW BOOK

Metallurgical Dictionary

By J. G. Henderson. Published by Reinhold Publishing Corp., 330 W. 42nd St., New York 36, N. Y. 1953. Price: $8.50. 366 pages plus appendix.

Assisted by J. M. Bates, the author has compiled an exceptionally complete reference book which contains over 5,000 definitions and descriptions covering the field of physical metallurgy. The listings are not loaded down with obsolete terms and have been limited to pertinent material only.

The book has been prepared for the use of those who manufacture or use metal products and the metal finisher will find it quite handy since he often meets up with technical terms unfamiliar to him and unavailable in the usual dictionary. He will even find most of the plating terms in the listings and related items have been nicely cross-referenced. We would consider the books a very desirable addition to the metal finisher's library, filling, as it does, the need for a convenient, up-to-date source of information on metal terminology.

BUSINESS ITEMS

Siefen Appoints Elliott

The *J. J. Siefen Company* announces the appointment of *Cameron Elliott* in the Northern Ohio territory. Mr. Elliott will be located at 1241 Sunset Road, Mayfield Heights, Ohio.

Promat Appoints Swift Chemical

John A. Swift

The *Promat Division* of *Poor & Company,* 851 South Market St., Waukegan, Ill., has announced the appointment of the *Swift Industrial Chemical Co.* of Canton, Conn. as eastern sales representatives for the Promat line of metal finishing processes. Included will be Probrite-White Alloy, Promat copper cadmium and zinc electroplating processes and Promat chromate treatments.

The Swift organization has been active in the manufacture and sale of metal finishing, treating, cleaning and descaling compounds since 1949. *John A. Swift,* president, and technical director, a 1928 M.I.T. graduate, has served as assistant works metallurgist for the American Steel and Wire Company and chief metallurgist for the Billings and Spencer Company. He is currently active as chairman of the Hartford Chapter, A.S.M. and chairman, New England Conference, A.I.M.M.E.

Conway Appointed by Chandeysson Electric

Chandeysson Electric Company, St. Louis, announces the appointment of

Matthew H. Conway as mechanical engineer.

During the past nine years, Mr. Conway has served as drafting supervisor and engineer for the company. Prior to his connection with Chandeysson, he was in charge successively, of the drafting department, tool design department, production control department, and mechanical design department of a local shoe machinery company.

H-VW-M Appoints New Southwestern Representative

Hanson-Van Winkle-Munning Co., manufacturers of electroplating and polishing equipment & supplies, announces the appointment of *Joseph J. Cizas* as field sales representative for the southwestern territory of Missouri, Texas, Kansas, Arkansas and Louisiana.

Cizas will maintain his office in St. Louis. The company will continue its distributors in these states, with Cizas supplementing their coverage. He joined H.-V.W.-M. in May, 1953, and entered an intensive training program at the company's laboratory in Matawan. He completed training just before receiving his southwestern assignment.

Joseph J. Cizas

A graduate of Bowling Green State University, Ohio, Cizas received his B.S. degree in chemistry in 1949. He has also done graduate work in chemistry at New York University.

Carborundum Appointments

W. J. Ulrich, The Carborundum Company's senior sales representative in the Detroit area was elected vice-president of the company, according to an announcement by *F. J. Tone, Jr.*, vice-president and director. Mr. Ulrich will continue his sales activities in the Detroit area, however, he will report to the vice-president of sales in Niagara Falls, N. Y.

Mr. Tone also announced the election of *F. W. Bonacker* to assistant vice-president in charge of sales for the firm's Bonded Products and Grain Division. Other appointments to Niagara Falls posts in the Bonded Products and Grain Division were: *W. J. Kingsley*, sales manager for industrial product lines; and *J. G. Fritzinger*, sales manager for special accounts.

Appointments to headquarters posts of the Coated Products Division in Wheatfield, New York, were: *John F. Claydon*, director of the industrial sales branch; and *H. P. Dales*, industrial sales manager.

The New York and Philadelphia sales districts were combined into a new sales district designated the Middle Atlantic Sales District, with *J. A. Decker* as district sales manager. Other district sales managers appointed were: *W. D. Dickerson* for the Detroit district; and *H. C. Smith*, St. Louis district sales manager.

District sales managers of coated abrasive lines appointed were: *Carl L. Adelman* for the Middle Atlantic district; *F. M. Mansberry* for both the Cleveland and Pittsburgh districts; *O. P. Quist*, Chicago District; and *J. G. Khoury*, sales manager for coated product lines in the Detroit district.

District sales managers for the Bonded Products and Grain Division's abrasive lines were: *F. J. Miller* for the Middle Atlantic District; *E. George*

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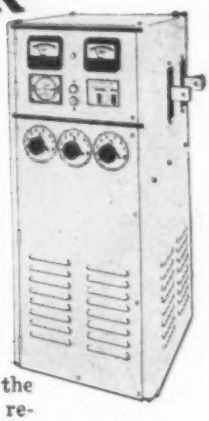
It comes out right
RICHARDSON-ALLEN
SELENIUM RECTIFIER



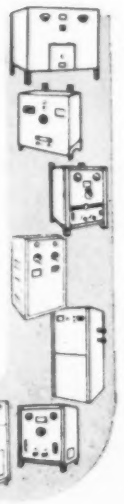
When "it comes out right" consistently, you know the satisfying result — greater output, highest quality, fewer rejects, lower labor costs.

This profitable achievement depends not only on your own skill and ability. It also requires and deserves the most dependable rectifying equipment.

You can assure the dependability of your d c supply by installing Richardson-Allen Selenium Rectifiers which have established records in hundreds of plants for long, trouble-free service.

The Richardson-Allen line includes various types and the widest selection of voltages and currents. For example, all models may be standard or plus rated; there is a choice of basic and remote controls; self-contained; heat exchanger; sequence programming controls; anodizing, and also suitable equipment for manodizing.

There is an R-A factory representative in most major cities. If you do not find him in your phone book, write directly to us.



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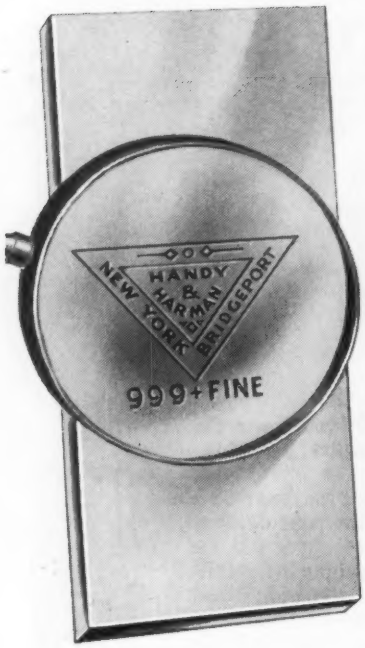
No need to do this... when you plate with SILVER ANODES that bear this stamp



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1. Highest possible standards in fineness.
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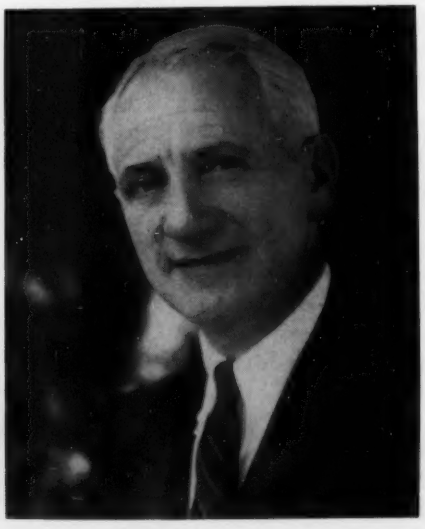
W. J. Ulrich



F. W. Bonacker

Ball, the Cleveland District; *R. H. Huntington*, Chicago District; and *H. J. Jeffers*, Bonded Products and Grain sales manager for the Detroit district.

Planteroth Appointed Treasurer of Knapp Mills, Inc.

Oscar E. Planteroth

The appointment of *Oscar E. Planteroth* as treasurer of *Knapp Mills Inc.* has been announced by *Alfred P. Knapp*, president of the New York firm which is the world's largest producer of lead clad steel and lead clad copper equipment for the chemical and process industries.

Mr. Planteroth will also serve as treasurer of a subsidiary, The Andrews-Knapp Construction Co. He has been comptroller of both firms since their inception.

Identified with the metal business since 1910, Mr. Planteroth has long been recognized in financial and credit circles as one of the senior executive officers in this field. During World War I, he was president and treasurer of Marx Lissberger and Sons, Inc., major producers of white metal alloys. During World War II he was vice-president of the Andrews Lead Construction Co., Inc. then subsidiary of the American Smelting and Refining Co., in which position he was responsible for financial control of construction costs.

A leader in credit circles, Mr. Planteroth has been active in the Manufacturing Clearing House, Inc. and New York Credit Men's Association, among other industrial organizations.

ARco Opens Ohio Region Office

Consistent with the ARco general expansion program in production and

sales facilities, *Automotive Rubber Co., Inc.*, of Detroit, Mich., and Houston, Tex., recently announced the opening of their new Cleveland sales office.

The Cleveland office will be headed by *B. C. (Bernie) Mulheran*. After eleven years of sales engineering experience in the corrosive-resistant ma-

B. C. Mulheran

terials field, Mulheran joined the organization recently to assume the post of Ohio manager.

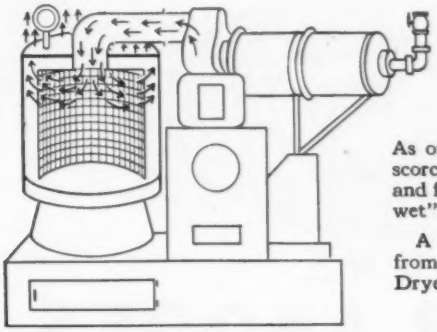
His technical background and broad, practical experience enable Mulheran to offer the nation's outstanding protective coating application facilities. He brings to the Ohio region the services of complete rubber (and allied products) processing plants in Detroit and Houston.

Industrial Filter Completing Expansion Program

To meet the ever-growing demand for its products, the *Industrial Filter & Pump Mfg. Co.*, 5900 West Ogden Ave., Chicago 50, Ill., is completing its third expansion program in the last six years. Included in the present program is a plant addition of 15,000 square feet and new equipment. This increased factory area will provide increased production and better delivery of its pressure filters and ion exchange equipment, rubber lining service for the chemical process industries, heat exchangers and centrifugal pumps for processing industries and oil refineries, and the salt fog and humidity test cabinets that are used extensively for accelerated testing of the quality and durability of plating and other finishes on metal products.

Supplementing these enlarged manufacturing facilities is a new research and development department that will work on improvements in the design and performance of the company's products, and on new applications,

EVER BLOW INTO AN ASH TRAY?

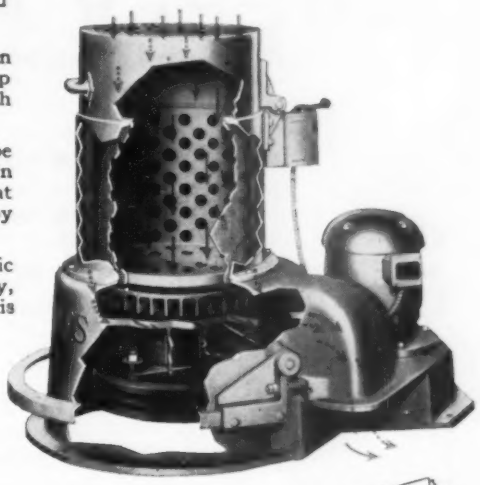


If you did, you saw a practical demonstration of the principle of air deflection. In old type dryers, air *blown* in from the top is deflected by the top layer of parts. As one user put it, "the top layer gets scorched, the next layer is nice and dry, and from there on down the parts are still wet".

A powerful suction fan *draws* the air from the bottom of the modern Nobles Dryer. Fresh air rushes in from the top to fill the vacuum and is drawn through the entire contents from top to bottom where it is expelled with the water.

Steam or electric heaters may be mounted compactly in the cover in contrast with space consuming, heat wasting, separate units connected by pipe.

An internal expanding, hydraulic brake stops the machine smoothly, and quickly. The "brake pedal" is a ring extending around the entire working area so that the machine can be stopped instantly from any working position. In the interest of faster drying and lower costs write today!



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Fast, Uniform Plating

EVERY DAY—EVERY LOT

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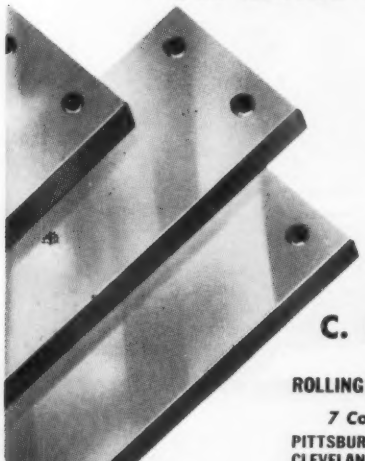
COPPER ANODES

FULL RANGE OF SIZES AND SHAPES



- PURE, UNIFORM COPPER
- FULL RANGE OF SIZES & SHAPES
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C. G. HUSSEY & COMPANY

(Division of Copper Range Co.)

ROLLING MILLS AND GENERAL OFFICES, PITTSBURGH 19, PA.

7 Convenient Warehouses to serve you promptly!

PITTSBURGH . 2850 Second Ave. CHICAGO . . . . 3900 N. Elston Ave.
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CINCINNATI . . . . 424 Commercial Sq.

IN STOCK AT SEVEN WAREHOUSES

also on the development of new products and services that will be announced and offered as soon as perfected. Pilot models of the company's products are set up to analyze customer problems in new applications of its equipment and unusual operating conditions. Also, a new experimental laboratory has been outfitted and staffed to study coagulation rates, treatment of industrial wastes, the conditioning of industrial process water, and ion exchange applications.

The office space was enlarged providing over 1,000 additional square feet for the waste treatment engineering department and the expansion of the other engineering departments. The engineering personnel has been doubled by the addition of specialists in the processes, methods, and equipment in industrial process-water conditioning, ion exchange treatment of industrial wastes, heat exchange, and metal finishing.

During the past year the company expanded its field service organization opening new branch offices with engineering specialists in several industrial centers.

Combs Promoted by Diamond Alkali

Promotion of *Eugene L. Combs* to the position of supervisor of chromic acid sales for *Diamond Alkali Company* was announced recently by *John S. Cort, Jr.*, sales manager of Diamond's Chromium Chemicals Division.

Well known in the production, engineering, and technical sales and service phases of the electroplating and metal-finishing industries for the past 17 years, Combs joined the organization in 1950. Since then he has been handling varied assignments in technical service, particularly those related to applications of chromic acid and its use in chromium plating.

From 1942 to 1947, Combs was assistant supervisor in the electrochemical engineering division of *Battelle Memorial Institute*, Columbus. Previously, he was associated in various production capacities with the Curtiss Wright Corp., Airplane Division, at Columbus, and also with the D. L. Auld Co., Inc., also of Columbus.

Born in Washington, D. C. and a graduate of Ohio State University, Combs is a member of the *American Electroplaters' Society*, Cleveland Branch. Also, he is a past member of this organization's Dayton Branch, and a charter member, past president and treasurer of the A.E.S. Columbus Branch.

Now Ohio Chairman for the Finance Subcommittee of the Society's Research Committee, Combs is also serving presently as general chairman of the A.E.S. National Convention and Fourth Industrial Finishing Exposition to be held in Cleveland in 1955.

Diamond's new chromic acid sales supervisor has contributed a number of technical articles on electroplating and other types of metal-finishing to various monthly magazines serving this specialized branch of the metalworking field.

He lives with his wife and two children at 1985 Idlehurst Drive, Euclid.

Minnesota Mining Promotes Leo E. Walker

Promotion of *Leo E. Walker* to the position of sales manager for hardware and paint trades in the St. Louis and Dallas areas was announced recently by the coated abrasives and related products division of *Minnesota Mining & Manufacturing Co.*

Walker previously had been a sales supervisor in these areas. He will headquarter in St. Louis. Walker joined 3M as a salesman in 1945.

Beckman Opens New European Office, Manufacturing Plant

Opening of a branch assembly plant and European sales headquarters in Munich, Germany, has been an

nounced by *Beckman Instruments, Inc.*, manufacturers of scientific and industrial control instruments.

Founded as a corporation under German law, the new factory will be staffed chiefly by Europeans, with some key personnel transferring from the company's U. S. plants. Production initially will be limited to portable pH (acidity) meters and quartz spectrophotometers.

The European Sales and Service Office will cover 18 countries overseas —including the United Kingdom, Germany, France, Italy, Spain, Switzerland, the Netherlands and Scandinavian countries.

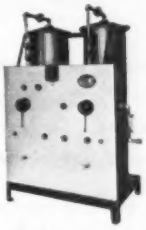
Harold Zander, a U. S. citizen, will direct this office, assisted by *Friedrich Schroeder* and *Joachim De Vos,* graduate engineers who have received intensive training at various Beckman factories in this country.

Chief function of the European office will be to render sales and service assistance, consult on instrument applications and provide on-the-spot field repair work for industrial plants.

The entire operation represents a first step in the company's expanded foreign activities, pointing to additional offices in Latin America and the Far East. Overall coordination of export sales and foreign service is handled by the newly-formed International Division, headed by *Robert T. Jones,* with headquarters at the main Fullerton, Calif. plant.

Address of both the German factory and European sales headquarters is Elektron Instrumente G.m.b.H., Gröbenzellerstrasse 13, Munch-Puchheim, Germany.

PURE WATER
for plating
at a fraction of former costs
by ionXchange



Water that's solids-free is trouble-free. Records show that more and more fabricators and finishers are finding a short cut to a better product at *lower cost* by installing an ILLCO-WAY De-ionizer . . . De-ionized water in rinsing or plating operations assures greater quality control and more operating economy. . . . Investigate also our new Chrome Purifier for recovery and purification of chromic acid anodizing or plating solutions.

Shown above: MODEL LU standard (Package-type) unit for production of solids-free De-ionized Water. Units completely assembled and tested in factory . . . shipped completely assembled, requiring minimum installation. Write for literature.

ILLINOIS WATER TREATMENT CO.
856-3 Cedar St. • Rockford Illinois

ILLCO-WAY

International Nickel Makes Initial Nickel Shipment Under Big U. S. Government Contract

From its vast Port Colborne refinery, *The International Nickel Company of Canada, Ltd.,* recently made the first shipment of metallic nickel under a contract calling for quick delivery of 120,000,000 pounds of the metal to the United States Government over a five-year period ending in 1958. Deliveries will be made at a monthly rate of 2,000,000 pounds until the contract is completed. With an additional output of 24,000,000 pounds annually, International Nickel's rate of nickel production is now approximately 275,000,000 pounds per year.

The additional 2,000,000 pounds per month production was made possible by the completion by Inco in 1953 of certain mining and metallurgical developments, the result of years of planning and research.

J. M. Davidson Named Asst. Sales Manager Pennsalt's Metal Processing Department

John M. Davidson has been appointed assistant sales manager of the *Metal Processing Department* of Pennsylvania Salt Mfg. Co., it was announced by *Joseph J. Duffy, Jr.,* manager of this department.

In his new position Mr. Davidson will be responsible for all field activity and for the supervision of product-sales supervisors. Before this appointment he was supervisor for Pennsalt cleaners, after serving as Philadelphia district sales manager for industrial chemicals.

Mr. Davidson is an active Naval Reserve officer, holding the rank of Commander. A graduate of Dickinson College, he earned his Masters degree at Temple University. He is a member of the American Electroplaters' Society, and the Chemical Club of Philadelphia. He, his wife and three daughters live in Wayne, Pa.

Industrial Filter & Pump Adds to Engineering and Field Staffs

Industrial Filter & Pump Mfg. Co., 5900 West Ogden Ave., Chicago 50, Ill. announces the transfer of *K. C. Johnson* from its home office to the Pacific coast as regional field engineer. He will work out of the company's

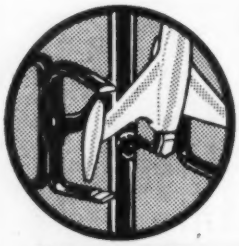
TIMELY FINISHING TIPS

Method of Racking

Platers in major industries depend on the experience and know-how of Naraco engineers to solve difficult plating rack problems. Such was the case with the illustrated rocket shaped hood ornament.

The problem of chrome plating without burning the ends of piece parts was answered with a rack designed for efficient, economical plating. Six parts are held firmly by means of a spring clip; accurate spacing and robber bars produced a uniform chrome deposit, free from any shading or burning.

Take a timely finishing tip from platers who know the value of Naraco's services and call your nearest Naraco plant today.



Close-up view of Tip and Robber Bar.

NARACO

NATIONAL RACK CO. INC.
179-181 Madison Street
Paterson, New Jersey

IMPERIAL RACK CO. INC.
1109 Stewart Avenue
Flint, Mich.

AMERICAN RACK CO.
703 W. Root Street
Chicago, Ill.

INDUSTRIAL RACK CO.
3462 N. San Fernando Road
Los Angeles, 65, Cal

offices at 816 West 5th St., Los Angeles and also the office at 115 New Montgomery St., San Francisco, Cal. Mr. Johnson joined the company in 1949 and most recently was assistant chief engineer. He is a member of the executive committee of the Western Society of Engineers.

J. C. Hesler has joined the engineering staff as head of the expanded Water and Waste Treatment Division. Besides a complete engineering service, this division of the company offers zeolite, filter, demineralizer units and the other equipment used in the treatment of municipal and industrial water supplies and also the disposal and recovery of chemical wastes from industrial operations. Mr. Hesler comes to the company with 15 years' experience in the water and wastes treatment field as research chemist, chief chemist, project and design engineer and in field engineering work.

Carborundum Buys American Tripoli Co.

An agreement has been reached by the *J. C. Miller Co.* of Grand Rapids, Mich. and *The Carborundum Co.* of Niagara Falls, N. Y. for the acquisition of the capital stock of the *American Tripoli Corp.* of Seneca, Mo., in accordance with a joint announcement of *General Clinton F. Robinson*, president of The Carborundum Company and *J. C. Miller*, president of the J. C. Miller Co.

Negotiations have been under way by J. C. Miller to sell American Tripoli to The Carborundum Co. for the past year.

Mr. Miller said American Tripoli owns deposits of and a plant for the production of "Seneca Standard" tripoli, an unusual form of silica found in the foothills of the Ozark Mountains.

Marketed throughout the world this strange non-metallic mineral is a unique physical form of silica which is double refracting and of the chalcedony variety. It is soft, porous, and has a fibrous structure, with no sharp edges or corners and average particle size of less than .01 millimeter. Highly porous and absorptive, "Seneca Standard" tripoli binds firmly with stearic acid, tallow, parafin, petrolatum, and oils with which it is mixed in various formulations. Applications include buffing and polishing compounds, lacquer finishing compounds, metal polishes, foundry parting, detergents, cleaners, polishing cloths, etc. Re-

K. C. Johnson

J. C. Hesler

search is presently developing additional uses for this remarkable mineral as a catalyst agent carrier in petroleum cracking and other industries.

Free Five-Year Scholarships for Northwestern University

In continuance of a program started two years ago, the Belke Mfg. Co. has again granted two full-tuition, five-year scholarships for the Northwestern University Technological Institute, available to students entering this fall.

Granted for the purpose of training better qualified men for the electroplating and metal finishing industry, the scholarships are of the cooperative type in which the student alternates college work periods with work periods in industry through a five-year program. At completion of the five-year course, the student receives the degree of Bachelor of Science in Engineering.

Upon enrollment, students attend college one and one-half years, then alternate twelve-week periods in college and twelve-week periods in industry. College subjects include mathematics, chemistry, physics, metallurgy and engineering. Industrial work consists of actual employment at the prevailing wage in plants such as the Belke Mfg. Co., other manufacturers of plating and metal finishing equipment, and in metal finishing shops or metal finishing departments of manufacturers.

In addition to providing practical contact with various metal finishing processes, the industrial work periods enable the student to be very near self-supporting.

Admission requirements of Northwestern include average high school grades in the upper quarter of the class, with three and one-half units of high school mathematics.

Further information will be supplied promptly on request to Raymond W. Kotz, Belke Mfg. Co., 947 N. Cicero Ave., Chicago 51, Ill.

Dean Products Forms New Division

Dean Products, Inc., 616 Franklin Ave., Brooklyn 38, N. Y., manufacturers of heat exchange equipment, announces the formation of the *Thermo-Panel Division* of the company to market a new plate-type coil which is said to be an improvement on pipe coils for heating and cooling.

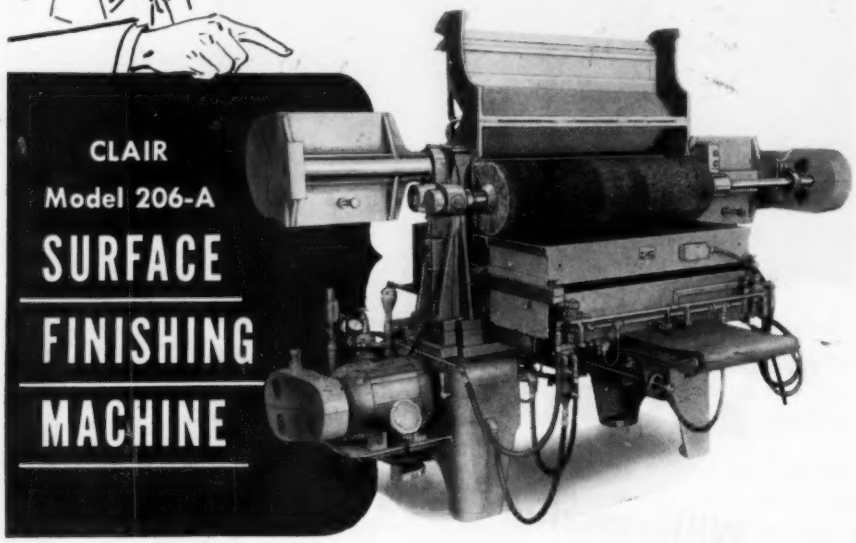
Get Better Results On
AUTOMATIC BUFFING
With the Famous
Williamsville CUTMASTER
Bias-cut construction — perforated steel center — perfect balance throughout . . . these CUTMASTER features give you cooler, longer runs without burning or raveling — save compounds, too. Ask us to show you how CUTMASTER Buffs can produce better results in your plant now. Write, wire or phone!
WILLIAMSVILLE BUFF DIVISION
EST 1893 A1 ®
DANIELSON CONNECTICUT
WILLIAMSVILLE BUFF DIVISION
The Bullard Clark Company
DANIELSON, CONNECTICUT

Brooklyn Evening Technical High School class in Electroplating accompanied by instructor Mr. Louis Serota visiting Hanson-Van Winkle Munning Company Laboratories and Plant at Matawan, New Jersey recently.

Here's the answer to your

SURFACE FINISHING PROBLEMS!

★ FROM ROUGH GLAZE TO MIRROR FINISH



This unit was developed primarily for surface finishing small hand tools such as pliers, screw drivers, ax heads, etc. Equipped for either mechanical holding or the use of a magnetic chuck, the machine is operated by an efficient electro-hydraulic system.

The spindle of the single roll will accommodate buffs ranging from 3" to 12" in diameter, as required by the geometry of the work being processed. Work area with mechanical holding fixtures is 38" wide by 24" deep; with magnetic chuck, 38" wide x 14" deep.

CLAIR

MANUFACTURING CO., INC.

Specialized Machine Equipment For Glazing and Polishing Operations

OLEAN, N. Y.

Write for Bulletin 206

Pierce Appointed by Diamond Alkali

David E. Pierce, nationally known chemical engineer, author and lecturer, has been appointed to the newly-created position of director of manufacturing control at *Diamond Alkali Company*, it was announced recently by *A. H. Ingley*, vice-president-manufacturing, for this leading producer of basic chemicals.

In joining the company's national headquarters in Cleveland, Pierce leaves New York, where he has operated his own consulting engineering business at 52 Wall Street for the past year.

Formerly chief engineer of the General Aniline & Film Corporation, New York, for 10 years, Pierce previously had been associated in the same capacity from 1927 to 1942 with the Rohm & Haas Company, Philadelphia. His experience also includes three years in chemical engineering development work with the Atlantic Refining Company, Philadelphia. Before that he held similar assignments for seven years with E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

Born in Monticello, Iowa, the new director of manufacturing control is a chemical engineering graduate of the Massachusetts Institute of Technology, Cambridge. He received his bachelor's degree at Wooster College, Wooster, O. A registered professional engineer in the State of New York, Pierce is also a member of the *American Chemical Society* and the *American Institute of Chemical Engineers*.

Stevens Appointments

Collin F. Stevens

Collin F. Stevens has been added to the Buffalo office sales staff of *Frederic B. Stevens, Inc.*, to represent their metal finishing sales division. He served two years with the U. S. Navy, then worked six years as Boston manager for another firm before joining the company.

Elmer F. King has been named a metal finishing sales representative in the New England area. In November he completed the training course in various lines of automatic and auxiliary metal finishing equipment manufactured by the Stevens organization. Previously King was in the U. S. Navy, and graduated in September from the University of Bridgeport with a major in Sales and Marketing.

Erratum

In the January issue, page 98, the photograph of Arthur Wrisberg, sales representative in St. Louis and Southern Illinois for Davies Supply & Mfg. Co., was mislabeled. Our apologies to Messrs. Loupee, Wrisberg and the firm.

Hutchings Named V.-P. of F. J. Stokes

Francis Dougherty, Jr., president, F. J. Stokes Machine Company, Philadelphia, Pa., announces the election of *Alan A. Hutchings*, sales manager of the company, to the newly created position of vice-president in charge of sales. In his new post, Mr. Hutchings will have full responsibility for all marketing activities of the company's wide range of products.

Mr. Hutchings joined the organization in 1940 as a sales engineer, specializing in plastics molding equip-

Alan A. Hutchings

ment, and in 1946 he was put in charge of all plastics sales and service. His duties were further extended in 1950 when he was named general sales manager for all company equipment, which includes high vacuum equipment, industrial tabletting and powder metal presses, and pharmaceutical manufacturing equipment.

A native of Chicago, Mr. Hutchings was graduated in 1933 from the University of Minnesota with a B.S. in Mechanical Engineering, and in 1935 from the Wharton School of Finance of the University of Pennsylvania, with an M.B.A. degree. Before joining the Stokes sales staff, he was a sales engineer with SKF Industries, Inc., Collins & Aikman Corp., and Carrier Corp.

Mr. Hutchings and his wife reside at 422 Hartel Ave., Philadelphia, Pa.

Maizo Mills Destroyed by Fire

Maizo Mills of Circleville, Ohio, manufacturers of Maizo corn cob products, used as a drying off medium in the plating industry, was completely destroyed by fire on February 11th. Damages were estimated at $100,000. Further plans for the concern are not known at this time.

National Research Corp. Opens New Sales Office

National Research Corp. has opened a sales office in Cleveland, it was announced by *Walter G. Overacker*, sales manager of the Equipment Division.

Representing the company in Cleveland is *George A. Goetz*, recently transferred to the Equipment Division from the Development Department. Mr. Goetz is a mechanical engineering graduate of Cornell University, has a master's degree from the Harvard Business School, and has been with the firm for almost two years. His new office is at 4205 Chester Ave., Cleveland 3, Ohio. The telephone number is Express 1-4484 or 1-4485.

Modern New Plant for Cincinnati Cleaning & Finishing Machinery Co.

The *Cincinnati Cleaning & Finishing Machinery Co.*, manufacturer of industrial cleaning, washing, paint finishing and baking equipment, recently acquired a new plant located at 2008 Hageman St., Sharonville, Ohio. The new plant contains the company's offices, engineering and estimating functions and manufacturing facilities. In addition to the new plant, the company operates two other plants in Ironton, Ohio and now has a total of 60,000 square feet of plant floor space.

Located on a five-acre plot with highway and railroad spur shipping facilities, the plant, of brick and concrete block construction, contains 3,500 square feet of office and engineering space and 11,000 square feet of fabricating space. Included in that portion of the building devoted to office facilities are two large areas, one devoted to engineering and design and the other allocated to estimating and purchasing, accounting and other office functions. Modern reception room, private offices and a well-appointed conference room complete the general office section of the plant.

Facilities of the new plant will be

cut cleaning costs RIGHT DOWN THE LINE!

METALWASH VAPOR DEGREASERS are 4-Ways BETTER!

UNOBSTRUCTED TANK WALLS. The condensing coil and trough are recessed into a back compartment providing *superior vapor control, more efficient solvent reclamation*, and an *unobstructed working area.*

WATER SEPARATOR and PUMP CHAMBER, fabricated of stainless steel, are *unitized* for easy removal in minutes.

SIMPLIFIED MAINTENANCE. Service connections, clean-out openings, and controls are located at one end of machine.

DEMAND-TYPE WATER CONTROL. Out of Metalwash research has come the improved technique of water temperature regulation for greater control and water conservation.

All types of vapor degreasers, automatic or hand operated, are available in standard and special sizes.

METALWASH PHOSPHATIZING MACHINES *provide ideal surface for lasting paint finishes.*

METALWASH SPOTLESS DRYER *eliminates hand-wiping of lacquered or plated parts.*

METALWASH TRIPOLI REMOVER *automatically removes tripoli and rouge.*

METALWASH®

WASHING PICKLING DRYING PHOSPHATIZING DEGREASING

METALWASH MACHINERY CORPORATION
923 North Avenue, Elizabeth 4, N. J.

concentrated on manufacture of specially designed finishing equipment. Machines of standard design will be fabricated in the company's other plants at Ironton, Ohio.

Electroplating Equipment Manufacturer Expands West Coast Facilities

In a move to expand its west coast activities, *Hanson-Van Winkle-Munning Co.*, Matawan, N. J., has acquired the assets, customer lists, good will, personnel and existing business of the *Electroplating Equipment & Supply Division* of the *A. J. Lynch Co.* in California.

This expansion is a logical outcome of previous association with the Lynch Company as the H-VW-M distributor in the San Francisco and Los Angeles areas. H-VW-M will utilize warehousing and shipping facilities of Lynch and maintain offices in Lynch buildings at Los Angeles and San Francisco.

Harold R. Smallman, assistant vice-president of H-VW-M, will continue supervision of company activities on the west coast. There Lynch salesmen join H-VW-M. They are *William A. Nairne* and *G. Stuart Krentel*, who will cover the Los Angeles territory, and *A. H. Nicholson*, who will continue serving the San Francisco area.

Distribution of H-VW-M products in Seattle will still be handled by the *Carl F. Miller Co.*, and in Portland by the *Zehrung Chemical Co.*

The A. J. Lynch Co. will devote their entire efforts toward their original and basic business of warehousing and distributing bulk chemicals for industry.

H-VW-M, originating in 1820, is one of the world's leading manufacturers of electroplating and polishing processes, equipment and supplies. With plants in Indiana and New Jersey, the company maintains sales offices in all principal cities in the United States.

News from California

By Fred A. Herr

Expansion of the electrolytic tinning line to up production in that department from 130,000 to 200,000 tons of electrolytic tin plate per year is included in an $8,000,000 expansion program announced for the Kaiser Steel Company's Fontana, Calif., plant.

The expansion is expected to increase by about 15% the plant's output of flat rolled steel products. Other phases of the expansion program include: new facilities for increasing the annealing capacity of the tin plate mill; installation of a mechanized conveyor from the hot strip mill to the tin plate mill; a new handling and conditioning yard for slabs; and a third slab heating furnace in the plate mill.

Marcus Rynkofs, owner of Liberty

Plating Co., Los Angeles, suffered a heart attack at his home on January 29 and was confined to Culver City Hospital, Culver City, for some ten days. Although he was permitted to return home on February 8, it is reported that, under doctor's orders, he will have to refrain from all business activity for an extended period. Fortunately, in his sons Stanley and Jean, whom he personally trained in the business, he has two competent platers who can carry on during his absence.

Jack Brase has acquired an interest in Southern California Plating Co. which recently opened a new finishing plant at 3434 South San Fernando Road, Los Angeles. He had previously spent more than 40 years in various executive positions with the Howard Automobile Co., Charles Howard Buick Co. and the Ed James Buick Co., Los Angeles. Southern California Plating Co. has been operated by *Leonard DuBell* since 1930. Production and finishing of license plates is one of its major activities.

Alan R. Burman, vice-president of The Cro-Plate Co., Inc., Harford, Conn., was a visitor in the West Coast the first week in February. His program included conferences with *Jack Raskin*, plating division director of the L. H. Butcher Co., Los Angeles; an address before Los Angeles A.E.S. Branch on February 10; talks before San Francisco Branch on February 11 and in Portland, Ore., on February 15, and a visit to Hanford, Wash. He also visited various Southern California and Pacific Northwest airplane plants, in which his company's products find a wide application.

Other California visitors during February were: *Harold Leever*, executive vice-president, and *J. Douglas Lunan*, treasurer, of MacDermid, Inc., Waterbury Conn.; *Clyde A. Crowley*, chairman of Graham, Crowley & Associates, Inc., Chicago; and *Theodore J. Andrews*, assistant to the manager of Battelle Development Corp., Columbus, O.

Installation in the near future of a new straight line for buffing aluminum lawn furniture is reported by Certified Chrome Furniture Co. of Inglewood, Calif. The new line will replace existing manual buffing methods. *Albert LeVine* is president, and *Floyd Klein* foreman of plating and polishing for this firm, which in 1953 opened one of the largest of Southern California's finishing plants.

Dexter Halldin, part owner of Tool & Jig Plating Co., Whittier, Calif., is back in a plaster cast for the second time in two years. Dexter reports that he fractured a vertebrae when an A-frame fell on him in the plating shop. He was encased in a cast from shoulders to hips in the spring of 1953 as the result of a spinal displacement sustained in a wresttling match with his brother.

Announcement of the formation of Sales Contact Co. was made in January by *Dodd Mauldin*, formerly general manager of the Los Angeles Die Casting Co. Membership is composed of 20 companies in diversified fields of production, each non-competitive in various aspects of metal processing, such as plating, brazing, casting, stamping, heat treating, forging, spinning, machining etc.

The purpose of the organization, as announced by Mr. Mauldin, is to serve

For the metals you need...
when and how you want them!

"Putting METTLE into METALS since 1896"

Belmont SMELTING & REFINING WORKS, INC.

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all metals • all alloys • all forms

as a clearing house for customer contacts, provide sales assistance to members dealing with prime contractors, and interchange sales and production ideas for the benefit of the group as a whole.

Metallurgical Consultants, Inc., recently moved into new office and laboratory quarters at 5821 East Randolph St., Los Angeles. The firm offers metallurgical staff service for consultation, research and development in the field of industrial materials and processes. Associated in the enterprise are *John J. Lawless, Jr.*, and *F. J. Robbins.*

An exhibit of titanium, the "metal of the future," was held recently at the State Museum of Science and Industry in Exposition Park, Los Angeles. Included in the display were titanium metal and dioxide pigments, titanium gem stones, and exhibits showing the source of the metal and production methods.

G. Stuart Krentel, sales engineer for the Hanson-Van Winkle-Munning Company's West Coast division at Los Angeles, was elected president of Los Angeles Branch of the *American Electroplaters' Society* at the February 10 meeting in Rodger Young Auditorium.

Since coming to Los Angeles originally as representative for MacDermid, Inc., seven or eight years ago, Krentel has given liberally of his time to A.E.S. affairs. He has filled all major offices of the branch from librarian to first vice-president. Krentel succeeded *John Millhorn*, formerly head of the Mefford Chemical Company's plating department, who recently resigned that position to establish his own plating supply firm in Los Angeles.

Other officers elected are: 1st vice-president, *Earl Arnold*, L. H. Butcher Co.; 2nd vice-president, *L. Truman Stoner*, Chief Products Co.; secretary, *Norman K. McEwan*, Virtue Bros.; Librarian, *George Hetz*, Mefford Chemical Co.; and treasurer, *George Magurean.*

The new board of managers is composed of three past-presidents: *Roy Lustutter* (1951), chairman; *Myron Orbaugh* (1952), and Millhorn (1953).

Initiation will take place at the March 10 meeting, at which a sergeant-at-arms will be appointed and delegates to the national convention elected.

One hundred and three members and guests were present when President Millhorn called the business session to order at 8 p.m.

The following guests were introduced by Sergeant-at-arms *Alex Heller*: *Del Cahill*, Jackson Buff Co.; *Cedric Israel*, Pacific Tank & Coating Co.; *Paul Madden*, Francis Plating Co.; *Clyde A. Crowley*, Graham, Crowley & Associates, member of Chicago Branch; *Theodore J. Andrews*, Battelle Development Corp., Columbus, O.; *Fred Weiss*, New England Lead Burning Co., Whittier, Calif.. *C. Weakley* and *R. C. Miller*, Cromate Co.; *James Stewart*, Stewart Rack Co.; *Robert Golden*, Winters & Black; *Louis Shoals*, Ambassador Hotel.

John Kostura of General Electric Co., and *Fred Stabille* of Palace Plating Co. were initiated into membership: Membership applications were filed by the following: *Charles Hanson*, California Rack Co.; *Fred Weiss*, New England and Lead Burning Co.; *H. W. Smith*, Cadmium Nickel Plating Co.;

BEFORE PRESSURE-BLASTING
AFTER PRESSURE-BLASTING
REMOVE FLASH FROM PLASTIC PARTS
. . . . ELIMINATE HAND FINISHING
. . . . WITH PRESSURE BLAST!
ONLY PRESSURE BLAST GIVES YOU 2-SPEED WET-BLASTING
FREE . . . Learn what PRESSURE BLAST can do for you! Die and Mold Polishing, Blending Grind Lines, Deburring, Heat Treat Scale Removal, Honing of Cutting Tools, Pre-plating Cleaning . . . Hundreds of proven, money-saving applications!
Write for our new 8 page fully illustrated Booklet . . . or send samples of work you want tested to:
MODEL A . . . ONE OF 4 STANDARD UNITS. CUSTOM MACHINES DESIGNED TO FIT SPECIAL REQUIREMENTS.
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*Glo - QUARTZ
ELECTRIC RADIANT IMMERSION HEATERS
Heat by far Infra-Red. The scientific application of heat to all plating, pickling and phosphatizing solutions.
Features:
• Underwriter's Lab. approved junction box
• Midget fuses inside junction box
• Guard, holder, and junction box have Plasti Sol-type coating
• Renewable heating elements
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WRITE FOR OUR 4-PAGE BULLETIN TL-52 . . .
Glo - QUARTZ ELECTRIC HEATERS CO., INC.
Mfgrs. of Fused Quartz Electrical Heating Elements
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James Grellenby, North American Aviation Co.; *Lester Daniels*, Modern Plating Co.; *Raymond Husband*, C&W Metal Finishing Co.; *William L. Cahill*, Jackson Buff Co.; *John Mazutti*, William R. Whittaker Co.; *Cedric Israel*, Pacific Tank & Coating Co.; *James A. Stewart*, Stewart Rack Co.; *D. F. Seymour*, L. H. Butcher Co.; *David L. Shine*, Bright Plating Co.; *W. C. Thomson*, Diversey Corp.; and *R. W. Nixon*, Quality Hard Chrome Plating Co.

Secretary Stoner reported on the illness of *Marcus Rynkofs* of Liberty Plating Co. and announced that flowers had been sent on behalf of the branch. *Morton Schwartz*, chairman of the Research Committee, reported that Los Angeles Branch has signed 14 sustaining members, as of February 1, making it the fifth in the Society in point of number of sustaining members.

Harold Smallman, vice-president and western manager of the Hanson-Van Winkle-Munning Co., gave a tribute to the late *George Hogaboom*. He reviewed the tremendous contribution to plating which Mr. Hogaboom has made. "He would not want you to stand in silence for a minute in his memory," Mr. Smallman said. "He would prefer that you follow in his footsteps by giving unstintingly of your time and effort to further the interests of the industry to which he devoted his life."

The speaker of the evening was *Alan R. Burman*, vice-president of The Cro-Plate Company, Inc., Waterbury, Conn. Mr. Burman's subject was "Pressure Blast, a New Metal Finishing Method." He discussed the application of pressure blast in metal finishing and electroplating, and outlined the various types of abrasive used for deburring, cleaning, blending, grinding, lapping, honing, buffing and polishing.

The 24th Annual Technical Session and Dinner Dance sponsored by Los Angeles Branch will be held at the Ambassador Hotel, 3400 Wilshire Boulevard, Los Angeles, on March 20.

The program pattern of previous years will again be followed, in the main, according to General Chairman *George Hetz*. There will be morning and afternoon technical sessions, a noon luncheon, and a dinner dance in the evening.

Two outstanding speakers have been selected for each of the technical sessions. Their names and subjects are:

Dr. H. Brown, Udylite Corp., Detroit, Mich., "Surface Activating Agents."

Robert Couch, United Chromium, Inc., Detroit, "New Developments in Chromium."

Robert Bailey, Beckman Instruments, Inc., Pasadena, Calif., "Instrumentation in the Plating Industry."

Myron Diggin, Hanson-Van Winkle-Munning Co., Matawan, N. J., "Helpful Hints on Unusual Plating Problems."

Chairman Hetz reoprted that the noon-day luncheon has been scheduled entirely without business or technical talks in order to allow ample time for the story telling contest, a popular feature of Los Angeles Branch affairs, which annually affords the members an opportunity to practice their tall tale telling ability. Attractive prizes have been assembled for awarding to the three winners, to be determined by volume of applause.

The evening program will get underway at 7 p.m. Scheduled are a dinner, floor show, dancing to orchestral music, and the annual waltz contest.

I take advantage of the Most Advanced Materials Available - such as **KEM-BOND**

You have a Superior type of Plating and with your high rate of Production - How do you do it?

I use Kem-Bond in place of acid in the plating cycle.

It has a cleaning action as well as an acid action.

By using Kem-Bond I clean faster therefore speed up my production and at the same time get a better plating finish.

I can throw plating in blind spots as fast as on the flat surfaces.

Kem-Bond helps to remove buffing and drawing compounds which aids in fast plating of wire goods.

Kem-Bond helps to eliminate hydrogen embrittlement.

Kem-Bond helps me to improve salt spray tests which is getting to be a strong factor in plating.

I eliminate fumes by using Kem-Bond therefore I eliminate costly repairs. Kem-Bond removes rust.

Give Kem-Bond a fair trial in your plant and it will surprise you.

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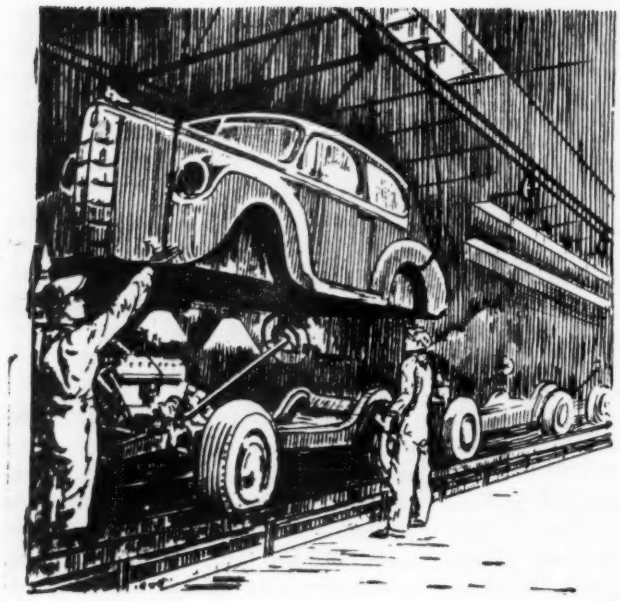

MOTOR CITY PLATING NEWS

Pennsalt Appoints Otto Aepli Chief Chemist at Wyandotte

The *Pennsylvania Salt Manufacturing Co.* has announced the appointment of *Otto T. Aepli* as chief chemist at their Wyandotte, Mich., plant. Formerly assistant chief chemist, Mr. Aepli replaces *Earl Sweetland*, who has recently retired.

After joining the company in 1944, he worked as senior research chemist at the company's Whitemarsh Laboratories in Wyndmoor, Pa. until 1951 when he went to Wyandotte.

Mr. Aepli took his Bachelor of Science from the University of Pennsylvania and has a Master of Science from Temple University. He is a mem-

★ BUFFING NU SPRA GLU
Liquid buffing compound
since 1945

★ NUGLU
Cold flexible glue
since 1937

★ BRUSHING NUGLU
Grain and Nuglu mixture
since 1941

★ SPRAY BUFFING EQUIPMENT
Guns, pumps, and valves
since 1945

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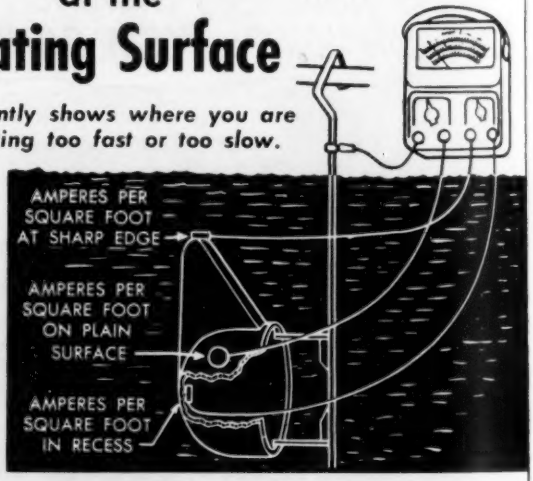
Measures Current Density at the Plating Surface

Instantly shows where you are plating too fast or too slow.



Yes—the BELKE-KOTZ Meter eliminates guesswork—delays—spoilage — and tedious measurements. Shows instantly current density at three selected locations on the article—with the article in any position.

NO FIGURING. Meter shows amperes per square foot — affords direct-comparison with current density table for the solution you are using. Eliminates trial and error. Enables you to plate to specifications at lowest cost.

Ask your BELKE Service Engineer or write —

BELKE MFG. CO., 947 N. Cicero Ave., Chicago 51, Ill.
EVERYTHING FOR PLATING PLANTS

ber of the American Chemical Society, American Society for Quality Control and Alpha Chi Sigma.

DeGroat Appointed Sales Manager By J. J. Siefen Co.

Clarence A. DeGroat

The *J. J. Siefen Co.* announces the appointment of *Clarence A. DeGroat* as sales manager. Mr. DeGroat has represented the company for the past seven years in Michigan and Ohio.

The company also announces the appointment of *Cameron Elliott* in the Northern Ohio territory. His address is 1241 Sunset Road, Mayfield Heights, Ohio.

Detroit Branch

The joint meeting of the Detroit Branch, A.E.S., and the Detroit Section of the Electrochemical Society was held on January 8, 1954 at the Hotel Statler. The President of the Detroit Branch A.E.S., *L. C. Borchert* presided and opened the meeting at 8:20 P.M. with approximately 155 members and guests present.

The announcement was made that *George Hogaboom* passed away. This is a serious loss to the Society and the entire plating industry.

Sect. treas. *Bob Racine* next reported receiving a letter from "Plating," requesting reviews from "Plating" from years 1910-1922 for the national records. Anyone having a copy of these years should send them in so copies can be made.

Fifteen applicants for membership were announced and were duly elected. This brings the total membership of the Detroit Branch A.E.S. well above the 545 mark.

It was further announced that Midwest Chrome, Solventol Chemical and the C. D. Sparling Co. have actively joined the sustaining members of the A.E.S.

Next, *Fred Olmstead*, program chairman, presented the movie "Good Fishing in South America," which gave evidence of the excellent marlin and swordfishing of our South American cousins.

BETTER COMPOUNDS *mean* MORE PRODUCTION *and* INCREASED PROFITS

Thirty years of experience developing and furnishing Polishing and Buffing Compounds to the Automobile Industry and hundreds of allied metal working firms entitles us to solicit the opportunity of working on your polishing and buffing problems.

WRITE US TODAY

C. H. McAleer, President.

DETROIT CHEMICAL SPECIALTIES, Inc.

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ELECTRODEPOSITION and METAL FINISHING

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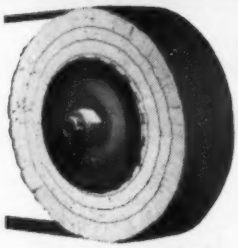
April 21-24, 1954

HOTEL RUSSELL **LONDON, ENGLAND**

A FEW OF THE MANY
FORMAX
PRODUCTS

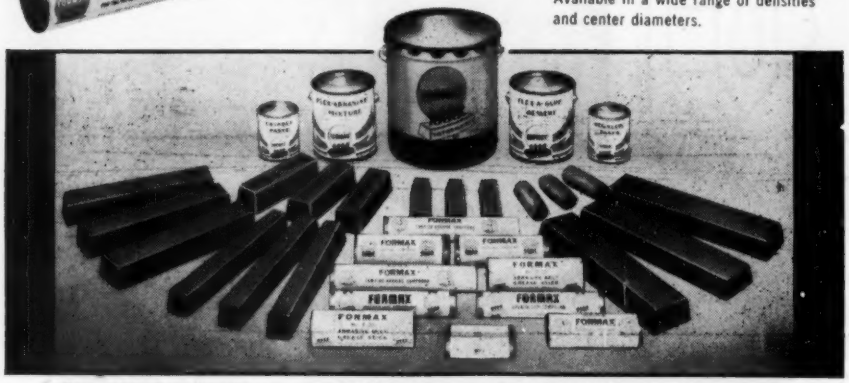


STYLE C-20
CONTACT WHEELS
and F-26 Belt Lubricant

A C-20 flexible Contact Wheel will form itself to the shape of the work and permit the abrasive felt to polish contoured surfaces and F-26 Abrasive Belt Lubricant will increase belt life by preventing loading and glazing. Produces finer, smoother and brighter surfaces through lubrication.

ZIPPO BUFFS

These famous long-wearing buffs run cool under all buffing conditions. Constructed of high count bias-cut cloth or sisal mounted on safe steel centers. Available in a wide range of densities and center diameters.



A complete line of buffing compounds in bar form as well as in liquid form for brush or spray application. Also Flex-A-Glu polishing wheel cements.

Our Laboratory and Sales Engineering staff would welcome the opportunity to be of help in solving your finishing problems.

Send for descriptive literature

FORMAX MFG. CORP.
DETROIT 7, MICHIGAN
"THE FOUR McALEERS"

MANUFACTURED IN CANADA BY JOHN GALLOWAY LTD., KITCHENER, ONT.

Upon completion of the movie, the guest speaker of the evening, *Robert J. McKay* of the International Nickel Company, was introduced. His subject was "Corrosion of Nickel Plate by Oxygen Electrolyte Cells." In his talk, Mr. McKay discussed the history of the development of the oxygen cell, demonstrated slides showing the effect of oxygen electrolyte cells on various metals, discussed the setting up of apparatus and functioning of such, and described the effect on nickel plated steel. It was further mentioned that the oxygen electrolyte cell and the galvanic cell are much the same and reactions are almost identical. All of his points indicated that much work is currently being carried on in determining the reasons of corrosion.

A question and answer period followed, and the meeting was adjourned at 10:05 with fellowship continuing with the serving of beer and pretzels.

John C. Drinkwater,
Publicity Chairman

G. H. Walgren President of J. C. Miller Co.

Directors of *J. C. Miller Co.*, Grand Rapids, Mich., have elected *G. H. Walgren* president and general manager of the firm, succeeding *J. C. Miller*, who has been named chairman of the board.

Walgren, who has been executive vice-president of the company, became associated with the J. C. Miller concern 19 years ago in an accounting capacity. He is a native of Grand Rapids and had been associated with other local manufacturing firms before joining the Miller organization.

G. H. Walgren

The company, organized in May, 1923, by J. C. Miller, manufactures and distributes everything required for the polishing and plating industry and now is a leading national manufacturer of buffing compounds.

Besides Miller and Walgren, company officers include: Vice-president and director of research, *J. A. Badaluco;* vice-president and director of sales, *F. W. May;* secretary, *Mrs. John H. (Frances P.) Jakeway*, and assistant treasurer, *Elmer Christiansen.*

Udylite Names Sales Engineer

Richard R. Russell has been appointed a sales engineer for *The Udylite Corp.*, it was announced by *Clem H. Hohner*, Atlanta (Ga.) district manager.

Russell received a bachelor of science degree in marketing from the University of Detroit and has served one year in the U. S. Army. With headquarters at the plating supply

Richard R. Russell

firm's branch office in Atlanta, he will contact customers in the South Carolina, North Carolina and eastern Tennessee area.

Grav-i-Flo Appoints Jarvis

Eugene N. Jarvis

The *Grav-i-Flo Corporation* of Sturgis Mich., manufacturers of barrel tumbling equipment and supplies, has announced the appointment of *Eugene N. Jarvis* as factory sales and service representative in the Southeastern Michigan area. Mr. Jarvis joins the company with many years experience in the metal finishing field. His headquarters will be at the *Wagner Brothers* offices 400 Midland Ave., Detroit. Wagner Brothers Company has added the Grav-i-Flo line to its rapidly expanding facilities.

Wyandotte Chemicals Corp. Appoints M. E. Powers Manager Government Sales Department

M. E. Powers

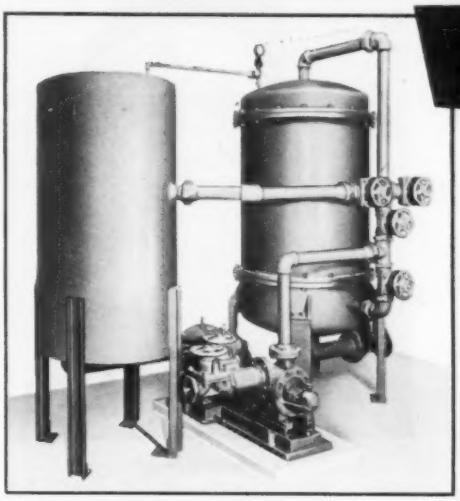
M. E. Powers has been appointed manager Government Sales Department by *Robert L. Reeves*, vice-president sales of the *J. B. Ford Division* of *Wyandotte Chemicals Corp.* Mr. Powers will supervise the selling of laundry detergents and alkalies, aircraft and ordnance metal cleaning products, paint strippers, tank desealants, de-icing solutions, dishwashing products, maintenance and general cleaners, germicides, insecticides, and specially formulated alkaline materials to all government agencies. He will headquarter at Wyandotte, Mich., and will work closely with the personnel of the new company chemicals research center in the development of products to meet military specifications.

Mr. Powers has done graduate work at Boston College where he majored in chemistry. He also studied accounting and contract law at Boston University. Joining the firm in 1940, Mr. Powers became manager of their New England sales office in 1946. From 1942 to 1945 he served 41 months in the U. S. Navy and was discharged a Lt. Commander. He specialized in the installation of electronic air navigation aids and for the last combat year headed this program in the Navy Department.

Electroplating Know How Scholarship Winner Selected

The *Joseph B. Kushner Electroplating School* of Stroudsburg, Pa., announces that *Kenneth Hampel*, of Grand Rapids, Michigan, has been

WAGNER BROTHERS FILTERS OFFER



DOUBLE ECONOMY

LOW OPERATING COST
LOW MAINTENANCE COST

Consider two factors before you specify filtering equipment:

1 The gallons of solution which can be efficiently filtered in a given period of time.

2 The cost of maintaining the filtering mechanism.

It's an established fact that Wagner Brothers Filters have a higher effective flow rate than any other equipment with *equal filtration area* . . . thus, gallon for gallon, it delivers *more* pure filtrate *per hour* at a lower unit cost. Sludge and other impurities (down to 1/10 micron) injurious to your plating quality are removed when the bath or solution is pumped through permanent membranes caked with a few cents worth of filter-aid (diatomaceous earth).

To clean, you simply turn a few valves and reverse the flow. Air bump backwash shocks the caked filter-aid from the membranes and through the sludge drain. Maintenance costs are reduced to ½ that of ordinary industrial filters since there is no messy replacement of bags, sheets or pads, no manual cleaning labor, no dismantling.

Standard models are available in capacities from 560 GPH up, filter areas from 3 to 100 square feet.

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awarded a scholarship in *Electroplating Know How*, the modern correspondence course in modern electroplating. Mr. Hampel's entry in the "What I Like And Dislike About The Electroplating Industry" Essay Contest, was selected as best by the judges, on the basis of sincerity and constructiveness of thought. The Board of Judges who selected the winning entry, consisted of *Nathaniel Hall*, Editor of METAL FINISHING, *Ezra Blount*, Editor of *Products Finishing*, and *Al Korbelak*, Editor of *Plating*.

Mr. Hampel is a research plating chemist for the Jervis Corporation where he does research and trouble shooting on production plating problems. Raised on a farm in rural Big Rapids, he has been associated with the electroplating and metal finishing industry since 1938 when he received his B.S. in Chemistry from Michigan State College. In 1941 he became an active member of the *American Electroplaters' Society*, Grand Rapids Branch, and has held several offices in the local organization. At present he is branch secretary.

Kenneth Hampel

He has two metal finishing patents to his credit and when he isn't talking shop the subjects that take up most of his time are his two small daughters of whom he is very proud. His favorite hobby is archery. He dabbles a bit with wood working and oil painting and is a member of the Grand Rapids Schubert Club, a male chorale society.

Kirkpatrick Promoted by Stevens

Arthur H. Kirkpatrick has been promoted to the newly created position of special project engineer as part of the reorganization plan at *Frederic B. Stevens, Inc.*, Detroit 16, Mich.

Kirkpatrick will work on the many new potential applications of the company's processing equipment presently being considered. Automation in metal finishing and waste disposal applications will also be included in this capacity.

Before joining the company in 1946, he was district sales manager for Ilg Electric Ventilating Co. for nearly 10 years. Prior to that he was employed by Lincoln Electric Co. and the Lamp Works of General Electric Co., both of Cleveland, Ohio.

Kirkpatrick is an Electrical Engineering graduate from the University of Michigan, Ann Arbor. He is a member of the Detroit Chapter's of the *American Electroplaters' Society* and *The Electrochemical Society*. He also retains membership in the Engineering Society of Detroit, Illuminating Engi-

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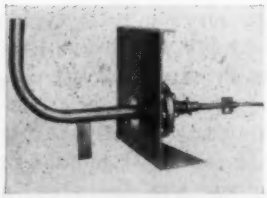

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Arthur H. Kirkpatrick

neering Society, American Society of Heating and Ventilating Engineers and Electrical Association of Detroit.

Manufacturers' Literature

Felt Products Catalog

Bacon Felt Co., Dept. MF, West Water St., Taunton, Mass.

A general catalog describing the Paramount Brand felt products is now available.

Included in the catalog are illustrations and descriptive matter on wool felt wheels, bobs and sheets and hair felt sheets and wheels. In addition, there are several valuable tables on felt wheel selection and specifications, "how-to-do-it" hints, and physical and chemical properties for each size and grade felt. Like earlier editions of the catalog, the new one should prove to be a valuable source book for materials finishers and manufacturers using felt in their products or processes.

Chemical Porcelain

U. S. Stoneware Co., Dept. MF, Akron 9, O.

Bulletin CP-50 on Chemical Porcelain has just been released by the above company.

This 8-page bulletin, fully illustrates and describes U. S. Stoneware's complete line of chemical porcelain; pipe, fittings, spacers, vertical check valves, stop check valves, hand-wheel valves, plug valves, swivel joints, expansion joints, sight glasses, flanges, ejectors, and tower packing.

Gold Plating

Technic, Inc., Dept. MF, 39 Snow St., Providence 1, R. I.

Reprints of an article by Dr. Parker, entitled "Analysis of Gold and Gold Alloy Solutions," are offered in an effort to correlate and assemble the great body of data on gold and its properties. The firm feels that the article is important because gold and gold plating are proving of value in many fields.

Storing Coated Abrasives

Armour & Co., Dept. MF, No. Benton Rd. & Webb St., Alliance, O.

In this booklet the manufacturer describes proper storage conditions of temperature and humidity to prevent deterioration of abrasive belts and other coated abrasives. Ideal types of storage room and control of atmospheric conditions are also detailed.

Transparent, Flexible Tubing

American Hard Rubber Co., Dept. MF, 93 Worth St., New York 13, N. Y.

Ace-Flex, a new all-purpose plastic tubing with unusual flexibility and

NEW
BRASS *plating*
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— can be used with present brass plating solutions

- Faster Plating
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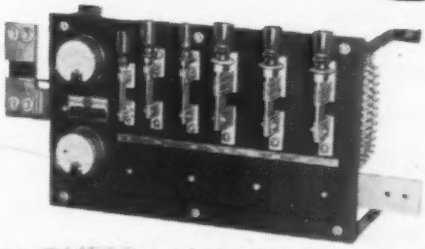

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Plating Tank Rheostats
Various Sizes with and without meters.

Write today for new Holland Equipment Catalog . . . complete with illustrated data & valuable information for the metal finishing field.

J. HOLLAND & SONS, INC.
276 SOUTH NINTH STREET • BROOKLYN 11, N. Y.

clear transparency, is covered in a new Bulletin 66-D. Physical properties, chemical resistance, standard sizes and general characteristics of the tubing are included in the 4-page, 2-color 8½ x 11″ bulletin. Many suggested applications in food and chemical processing, laboratory, medical, and general industrial uses are presented.

Rubberized Abrasives

Cratex Mfg. Co., Dept. MF, 81 Natoma St., San Francisco 5, Cal.

Presenting the adaptability, versatility and application of the firm's rubberized abrasives, together with complete specifications and prices is the interesting content of the new Catalog No. 53, just issued, which contains a most complete and comprehensive treatise about rubberized abrasives on burring, smoothing and polishing operations and their use in industrial establishments.

These rubberized abrasives are backed by 30 years of industrial, professional and technical application-performance and are manufactured in wheels, points, blocks, sticks and cones for machine or manual application. All products are made in four standard "grit-types" ranging from relatively coarse to extremely fine textures, and give excellent results on hard or soft metals, plastics, ceramics and other materials.

Measuring Flow and Liquid Level

Minneapolis-Honeywell Regulator Co., Industrial Division, Dept. MF, Wayne and Windrim Aves., Philadelphia 44, Pa.

Twenty-four page Bulletin 1160 describes a dozen different systems for measuring and controlling liquid level. There is a brief general sections on measurement, transmission and control; also handling of difficult liquids. Also included is two-page tabulation of twelve systems for quick comparison.

Plastic Pumps

Vanton Pump & Equipment Corp., Dept. MF, Empire State Bldg., New York 1, N. Y.

A new bulletin illustrating the company line of "flex-i-liner" plastic pumps has been prepared recently. These unique pumps, having neither stuffing box, shaft seals, gaskets nor internal valves, are designed specifically to handle highly corrosive fluids and abrasive sluries. The bulletin contains cut-away illustrations, diagrams, applications, operating specifications, performance data and listing of available body block and "flex-i-liner" materials.

Tank Linings

The U. S. Stoneware Co. Process Equipment Div., Dept. MF, Akron 9, O.

The above company has just released Bulletin K-10 on "Kel-F" welded membrane — a new approach to the "impossible" tank lining jobs.

This 4-page, two-color bulletin gives full information on how the new welded membrane can be utilized as a lining with virtually an unlimited size range for steel tanks.

Photographs on the assembly and installation of this unique membrane as well as charts on physical properties, temperature range, and chemical resistance make this an informative booklet for engineers confronted with tricky lining jobs.

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Barrel Nickel Plating with TRUE BRITE NICKEL BRIGHTENER

Increase Production

easy to control . . . cuts down on trouble that entails costly delays.

Save time

can be operated at a higher speed.

Reduce Rejects

gives unbelievable uniformity of deposit in recesses . . . brighter, white color.

Write for **FREE** *bulletin revealing tricks on improving your nickel plating and cutting costs.*

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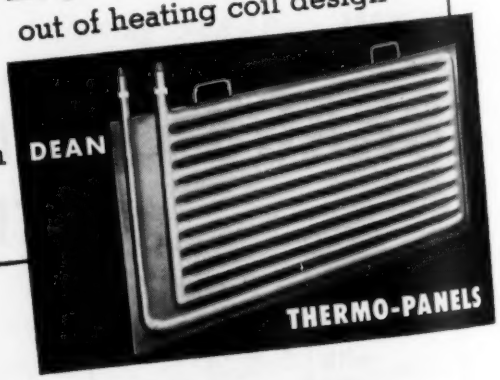
Take the guesswork out of heating coil design with DEAN



• For use in the heating or cooling of solutions for plating, degreasing, metal washing, bonderizing, etc.

These engineered, scientifically designed heat exchangers provide performance that can be definitely anticipated. They are low in first cost . . . light weight . . . easily replaced . . . simple to clean. Available in special shapes such as "U's", "L's" and cylinders . . . and a wide range of materials, including iron, stainless steel, monel and other special alloys.

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DEAN PRODUCTS, INC. • 616 Franklin Ave., Brooklyn 38, N.Y.
STerling 9-5400

Hints on Vacuum Pump Care

F. J. Stokes Machine Co., Dept. MF, 5500 Tabor Road, Philadelphia 20, Pa.

Dozens of practical tips on installing, operating and maintaining vacuum pumps and vacuum systems are contained in "How to Care for Your Vacuum Pump," a new 16-page handbook.

The manual, intended for all who install, operate and service vacuum pumping equipment contains such helpful hints as: the proper way to make leakproof connections in vacuum piping layouts; recommended types of gages, valves, fittings and gaskets; step-by-step trouble-shooting procedures to be followed when the pump is knocking, will not start, or will not produce a satisfactory vacuum; and some 25 "Do's" and "Don'ts" to insure long and trouble-free service life of vacuum systems.

Polyethylene Valves

Vanton Pump and Equipment Corp., Dept. MF, Empire State Bldg., New York, N. Y.

A new bulletin describing the Vanilene polyethylene valve is offered to those concerned with flow control of corrosive fluids. Containing diagrams, illustrations and complete specifications, on 1" and 2" polyethylene valves, this information will be of particular interest to those in the chemical and allied industries.

Unit Type Dust Collector

Pangborn Corporation, Dept. MF, Hagerstown, Md.

Pangborn Corporation announces the availability of a four-page, two-color bulletin, No. 916, describing the Unit-Type CN cloth bag dust collector.

This bulletin tells how dust control for all types of finely divided dry dusts can be provided for smaller volume applications at low equipment and installation costs. It points out how the collector was designed for indoor use, permitting clean air to be discharged inside the plant; a practice which results in a distinct savings where air is heated or cooled.

Detailed descriptions of the dust collector operation and the cloth bag sealing mechanisms are presented. Also included, are the construction and assembly features of each dust collector.

Photographs show front views of the 400 and 800 size collectors and a closeup of cloth bags supported on shaker channels. Line drawings give the side and front elevations of the various size collectors.

Pertinent data, such as weight, number of hoppers, cloth area, dimensions and diameter of inlets and outlets for each collector are given in chart form for the reader's convenience.

Demineralizer Catalog

Barnstead Still & Sterilizer Co., Dept. MF, 129 Lanesville Terrace, Forest Hills, Boston 31, Mass.

The publication of a new 20-page catalog, No. 127, which describes the firm's entire line of mixed-bed, two-bed, and four-bed demineralizers for laboratory, hospital, and industrial use, has been announced.

The new publication, which contains many photographs, drawings, and diagrams, explains in detail the principles, construction, and operation of both mixed-bed and multi-bed demineralizers, ranging in capacity from 5 - gallon - per - hour laboratory units to industrial installations pro-

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More lives than a cat ...Monel

You get more service life out of Monel® pickling equipment than a cat gets out of his nine lives.

In pickling operations, Monel withstands the corrosive action of acids. It's tough. It's durable. Gives years of trouble-free service. And it can readily be repaired to give it a new lease on life.

Now's the time to check over your pickling equipment. Then see your distributor of Inco Nickel Alloys for complete information on Monel. Meanwhile, write for a copy of "5 Way Savings ... in Pickling." It's yours for the asking.

THE INTERNATIONAL NICKEL COMPANY, INC.
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Monel PICKLING EQUIPMENT extra life extra capacity extra safety

ducing 2,500 gallons per hour. It gives dimensional and performance data on all models and explains the difference between distilled and demineralized water, considerations affecting selection of proper equipment for a given job, and the actual installation and operation of these demineralizers.

Sodium Sesquisilicate

Philadelphia Quartz Co., Dept. MF, Public Ledger Bldg., Philadelphia 6, Pa.

The manufacturer of detergents and soluble silicates, announces the publication of a booklet which describes in detail the properties and uses of its product, Metso 99, Sodium Sesquisilicate. It deals with the evaluations of sodium sesquisilicate with respect to the basic detergent properties of wetting, emulsification, dirt suspension and prevention of re-deposition. Also included is a demonstration of the product's ability to protect sensitive metals such as magnesium, copper, zinc and brass when used alone or in conjunction with synthetics and polyphosphates. Popular detergent uses and general directions are tabulated by industry.

Process Control Instruments

Fischer & Porter Co., Dept. MF, 924 Jacksonville Rd., Hatboro, Pa.

A new catalog (two color, 20 pages) describing process control instruments available for immediate shipment from its offices in Hatboro, Chicago, Dallas, and Los Angeles is announced by the company. The catalog lists a variety of flow meters, recorders, controllers, pressure regulators, sight flow indicators, and chemical feeders, giving discounts from list price as well as additional quantity discounts. Complete instrument specifications are clearly set forth. Sizing nomographs for the two most common types of Flowrator meters are also given covering both liquid and gas service.

Vacuum Coating

National Research Corp., Dept. MF, 70 Memorial Dr., Cambridge 42, Mass.

The above firm has issued a brochure on "Continuous Vacuum Coating" which discusses the process, its background in continuous vacuum coating, equipment required, products produced, and its patent and licensing policies. Copies may be obtained by writing to the above address.

Fan Engineering Data

Hartzell Propeller Fan Co., Dept. MF, Piqua, O.

A wealth of valuable ventilation engineering information is included in Bulletin A-108, "Fan Engineering Data," newly issued by the company, manufacturers of industrial air-moving equipment.

Among the material selected by company engineers for inclusion in this 16-page brochure are fans laws and formulae, terms and definitions, recommended velocities for exhaust hoods, an air pressure conversion table, and charts covering duct resistance, entrance losses and rectangular equivalents of round ducts.

Other sections discuss fan installation, maintenance and lubrication, explain noise problems, and show the characteristics of various propeller and wheel designs.

Resistance Thermometer Bulbs

Minneapolis-Honeywell Regulator Co., Industrial Division, Dept. MF, Wayne and Windrim Aves., Philadelphia 44, Pa.

Catalog 5701 describes resistance thermometer bulbs of high speed,

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marine, room temperature and sanitary types, for temperature spans as narrow as 20°F. Also included are wet and dry bulb resistance thermometer assemblies for measurement of relative humidity.

Wet Blasting Machine

American Wheelabrator & Equipment Corp., Dept. MF, 1179 South Byrkit St., Mishawaka, Ind.

Bulletin 93, describing its new Model 30 Liquamatte wet blasting machine, has been published recently. Complete general specifications and illustrations are presented. The Model 30 is designed for all sorts of precision cleaning and finishing operations involving small parts which can be lifted and handled manually, and which are capable of going through a door opening 22½" x 19".

Vaneaxial Blowers

Hartzell Propeller Fan Co., Dept. MF, Piqua, O.

Direct-drive vaneaxial blowers, three types of belt-drive vaneaxial blowers and a special portable blower for exhausting fumes from tanks are described in a new bulletin A-110, issued by the company.

The 16-page brochure includes dimension drawings and figures and complete air delivery tables for all of these blowers. Two of the belt-drive models, a high-temperature blower and a new design for low volume, high pressure requirements, are new lines which have not been shown in any previous catalog.

Liquid Abrasive Blasting

American Metaseal Mfg. Corp., Dept. MF, West New York, N. J.

The complete story on the newly developed Metablast process for controlled surface finishing is available in a new, four-page, two-color bulletin.

Photographs show how a pre-determined, consistent finish can be applied to metal parts through the use of a special abrasive suspension applied to parts by means of air pressure. "Before and After" views of various parts are shown, and a detailed description of the operation of the new precision-built, space-saving Metablast machine is included.

Special sections explain the variety of problems the process can solve and tell why it is an improvement over other metal surface treatments. A table of specifications accompanies a list of special features and available accessories for "custom-tailored" units.

Associations and Societies

AMERICAN ELECTROPLATERS' SOCIETY

1954 CONVENTION NEWS

Plans for the forty-first annual convention of the American Electroplaters' Society are going ahead at a rapid pace, and there is every indication that, under the sponsorship of the New York Branch, this year's meeting will be an outstanding affair. The Convention will be held at the Hotel Statler, New York City, July 12-15.

Arrangements are being made for the various branches to exhibit unusual and exceptionally interesting products.

George Cooperman, chairman of the Exhibits Committee, reports that, based on the outstanding response from many of the branches assuring him of their intentions to exhibit

Simplify your bright zinc plating with

McKeon's Zinc-Brite

TRADE MARK REG'D.

as a constant cleanser and purifier

It will:

1. Precipitate heavy metal impurities.
2. Co-precipitate copper impurities, eliminating need for zinc dust treatment.
3. Minimize need for decanting or filtering.
4. Precipitate excessive carbonates.
5. Reduce Brightener consumption.

Try a 5-gallon can, $15.00; or a 15-gallon drum, $42.75, on 30 days' approval.

Sulphur Products Co. Inc.

228 McKeon Way
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FILTER 50-1500 GAL/HR ANY ELECTROPLATING SOLUTION

NO ROUGH DEPOSITS
NO PITTING

SERVICE: Filters practically any acid or alkaline solution from pH 0 to pH 14; removes particles down to one micron in size. Strainer stops metallic objects.

DESIGN: Filter Assembly fabricated of stainless steel 316, high temperature lucite, rubberlined, Haveg, or Sethrin* resin. Filter Tubes of cotton, dynel, porous stone, or porous carbon. Pumps fabricated of Hastelloy, stainless 316, or plastic; centrifugal or self-priming. Motors drip-proof, totally enclosed, or explosion-proof, 110 or 220 volt, single or three-phase, 50 or 60 cycle, sleeve or ball bearing. Hose—special acid and alkali resistant. Base—Phenolic laminate on rubber tire ball bearing casters.

*Reg. App. For

Distributors in Principal Cities

Model	Rated Capacity	Overall Size	Weight
LSI-5	50 gal/hr	11" x 14" x 12"	30 lb.
LSI-10	100 "	12" x 16" x 16"	40 "
ASI-300	300 "	2' x 2' x 2'	125 "
ASI-400	400 "	2' x 2' x 2'	135 "
ASI-600	600 "	2' x 2' x 2'	150 "

*REG. APP. FOR

Sethco MFG. CO.

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74 Willoughby Street
Brooklyn 1, New York

plated specimens, this should be the most exceptional exhibit ever displayed at an annual convention. George requests that secretaries who have not replied to his letter regarding the exhibit please do so at their earliest convenience.

The New York Branch looks forward to receiving many exhibits from local firms. There are probably more diversified types of electroplating done in the New York area than in any other part of the United States. Such operations as plating of cadmium, nickel, chromium, gold, silver, rhodium, etc. are quite common. Plating on non-metallics such as plastics, glass, wood, horn, etc. is also done. Plants doing other types of finishing such as vacuum metallizing and organic types of coatings are also quite common. Barrel plating installations are numerous and quite large. Some plants, though quite small, still carry on in color finishing of medallions, base reliefs, etc. This area still boasts of some job shops which do torch coloring, hand relieving of bronzes in greens, blues and the regular bronzing operations. More difficult finishes such as "Mother-of-pearl," and other oxidized finishes on silver are also done in our city.

A plant which has no generator, but since it has direct current available, works by means of electric light bulbs to control the current supply in its plating baths. This plant does refinishing of musical instruments and has gained a reputation as one of the best refinishing shops on this type of work in the area.

The largest collective group of Job Shop Owners in the area is the Masters' Electro-Plating Association, Inc. Any type of finishing can be done by at least one member of this group. The M.E.P.A. has pledged itself to two tasks: first to furnish their customers with the best quality of work; second, to further the interests of the industry. Officers of the group are Philip Ranno, chairman of the executive committee, Alfred D'Agostino, vice chairman; Frank Kaiser, treasurer; and Silvio C. Taormina, executive secretary.

Metal Finishing Suppliers Association

The support of A.E.S. activities by

Angelo Amatore
New York Branch President

the industry's manufacturers and distributors is extensive throughout the whole year, but is especially evident and instrumental in the success of each year's annual convention.

The Association's first activity will be the Annual Fellowship Luncheon and business session on Monday, July 12, the first day of the convention, which is open to supply houses

"ROCHESTER" PATENTED* CHROME PLATING ANODES

Showing 6 rib style with lifting handle. *Pat. #2,666,029

One piece construction—no lead burning—hook is part of body. Copper bar with sharp edge exposed insures good contact. Heavy cross-section insures long life. Better than average throwing power. Economically priced. Available in Antimony-Lead and Tin-Lead, 3" wide. Note prices on popular sizes. (Length is overall including hook.)

	6% Antimony-Lead		4% Tin-Lead		7% Tin-Lead	
	3 Rib	6 Rib	3 Rib	6 Rib	3 Rib	6 Rib
24"	4.95	5.97	5.52	6.22	5.76	6.58
30"	5.70	6.99	6.46	7.36	6.76	7.81
36"	6.45	8.01	7.40	8.50	7.76	9.04

Prices are less lifting handles; if wanted, add $1 per anode. Prices on other sizes on application. Prices subject to change. Shipped prompt and freight allowed east of Mississippi River. Inquiries on pure lead or pure tin or special formula or special shape also solicited.

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DANGED IF I KNOW,, I'LL CHECK ON IT. SEEMS AS THOUGH ALL I GET DONE IS PAPERWORK ON THESE NEW JOBS!!!
XYZ CO.
GREASE
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STAINLESS
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NOW, IF JOE HAD ONE OF THESE HANDY, NEW SCHAFFNER "BUFF 'N POLISH CALCULATORS" HE'D HAVE ALL THE ANSWERS IN A JIFFY! SEND FOR YOURS T'DAY IT'S FREE!
WRITE SCHAFFNER NOW ON YOUR CO. LETTERHEAD.

Write today for free new Catalogue and Samples - Schaffner Mfg. Co., Pittsburgh 2, Pa.

George Cooperman
Exhibits Chairman

and all representatives catering to the industry.

That evening the M.F.S.A. will again sponsor the Fellowship Open House Party, which is always a highlight of the convention.

Joe Duffy, our perennial Golf Chairman, is busy making arrangements for the golf tournament which will be held during the convention.

Rockford Branch

The Rockford Branch of the A.E.S. will hold its annual Educational Session and Banquet April 3rd, 1954 at the Hotel Faust, Rockford, Illinois.

Indianapolis Branch

On February 3, 1954 thirty-one members of the Indianapolis Branch met at the Fox Steak House at 6:30 P.M. for a steak dinner. An additional eight members came for the program at 8:00 P.M. *Abraham Max*, president, asked for introductions after which followed the reports of the secretary and treasurer. These reports were accepted in a motion made by *Herb Kennedy* and seconded by *Quentin Shockley*. *Marshal Whitehurst* reported on the annual dinner-dance of May 15th at the Indianapolis Athletic Club. *Edward Bruck* is in charge of the tickets which are on sale now.

Mr. Kennedy reported on the April 3rd regional meetings at Cincinnati. *Dr. George Swift*, national president, will preside at the meetings. Kennedy stated that the plant visitations for Saturday morning had been cancelled as part of the day's program.

The program of the evening was given by *Walter Binai*, one of our members, who recently returned from a three months trip to Thailand. Mr. Binai told us of the trip by plane from Indianapolis, its stops at Newfoundland, British Isles, Europe, Africa and then his destination. This was the first visit to his native land since he left in 1920. His twin brother is minister of finance of Thailand. Mr. Binai told of the customs, living conditions, weather, and many points of interest. He showed many colored slides of the trip and everyone was very interested. Many questions were asked by the group. Mr. Binai made one statement at the end of his talk which is all too true. He said that when the plane landed at the local airport, he was the happiest person on earth to be back in the U. S. "the Shangrila" of the world.

The meeting adjourned at 9:30 P.M.

Respectfully submitted,

Edna Rohrabaugh,

Secretary

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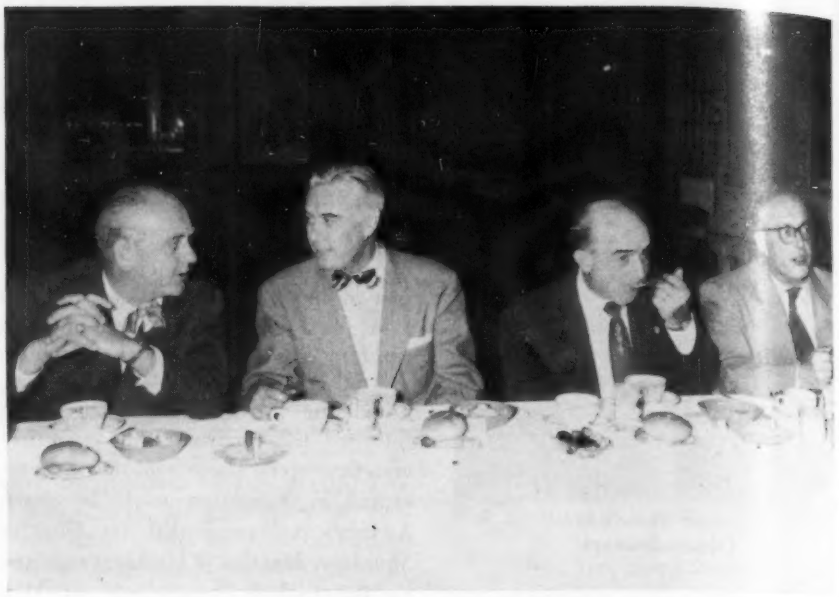
Baltimore-Washington Branch

On Tuesday, January 12, 1954 at 8:00 P.M. the Baltimore-Washington Branch held a meeting at the Hotel Stafford in Baltimore, Maryland. The order of business at this meeting was short, consisting largely of a discussion as to the feasibility of the A.E.S. including the organic finishing industry within its scope and the election of six applicants to membership. The rest of the evening was spent listening to an excellent talk on Radioactive Tracers in Metal Cleaning Research given by *James W. Hensley* of the Wyandotte Chemical Co.

Carl H. Thiede,
Secretary

Milwaukee Branch

January 8th was a red letter day for the Milwaukee Branch. The Branch held its 20th Annual Walter Pinner Dinner in honor of *Walter Pinner*, Houdaille-Hershey Corp. One hundred members and guests turned out for this occasion. After his report on the "Progress of Project 15" (a project designed to develop a new accelerated corrosion test) Mr. Pinner described some interesting corrosion work which is in progress at the Process Development Division of Houdaille-Hershey Corp.



Seated left to right: Walter Kessler, Judge Wm. O'Neill, Walter Pinner, Glen Schwemmer.

Both members and Mr. Pinner recalled the past 20 years and his association with the Milwaukee Branch. The evening was closed with the ceremony of presenting Mr. Pinner with a leather suitcase as a token of appreciation for his services to the Milwaukee Branch.

C. Peter
Assistant Secretary

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Cincinnati Branch

President *C. Truman* opened the January 27th meeting at 8:45 P.M. with thirty-six members and guests present. Secretary *Young* read the minutes of the previous meeting. The minutes were approved as read. Treasurer *Speers* gave a report on the treasury. The Treasurer's report was approved as read.

Mr. Truman announced that Mr. Speers would have the tickets for the Annual Banquet for distribution among the membership immediately after the meeting. Librarian *Rarick* announced that the next meeting would consist of an open discussion on plating conducted by a panel of four members, namely; *Edwin Roof, William B. Stephenson, Lester Helmich* and *John Magly*.

Wil Loveless, as chairman of the annual Tri-State Regional Meeting committee gave a report on the progress of the committee to date. He reported that because the factories would not be operating on Saturday, the plant inspection trip and the luncheon had been called off. He reported that all arrangements had been made by *Ezra Blount* for the appearance of three speakers.

Mr. Loveless announced that the Banquet and Dinner Dance tickets would sell for $7.50 per person. President Truman discussed the interim meeting to be held in Toronto on February 13, 1954. He appointed the following delegates and alternates to represent the Cincinnati Branch for 1954:

Delegates: *Ezra Blount, L. A. Critchfield* and *Bill Young*.

Alternates: *Wm. D. Gordon, Ray Barry* and *R. D. Miller*. Mr. Blount and Mr. Critchfield announced that they would attend the interim meeting in Toronto. A discussion was held about the members who would be delegates for the office of the third vice-president of the National Society. It was announced that the Committee for the annual picnic would be appointed at the next meeting. Ezra Blount, Lester Helmich and Aubrey Holt were appointed as a nominating committee to nominate officers for the election to be held in April 1954. *Charles Wise* moved that Cincinnati try to become the host branch for the National Convention in 1958 or later. The motion was seconded and carried.

President Truman introduced *Dr. Roy O. McDuffie* as the speaker of the evening. Dr. McDuffie gave a very interesting talk, augmented by slides, on the Fundamentals of Electroplating. The talk was followed by an interesting discussion session and the meeting adjourned at 10:00 P.M. The Social Hour following the meeting was sponsored by The Chipman Supply Co.

William Young,
Secretary

Louisville Branch

Minutes of December 17 ,1953.

The usual dinner and business meeting held each month was recessed due to the proximity of the regular meeting date with Christmas activity. For those stalwarts who attend every meeting, a special showing of a full length film was given in the auditorium of the Speed Scientific School, University of Louisville. The film was entitled, "Corrosion in Action" produced by the International Nickel Co. This film pre-

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sented in vivid graphic representation, how and why galvanic corrosion takes place. A better understanding of the galvanic series of metals, and the factors affecting corrosion rates was gained by all who were fortunate enough to witness this excellent film.

Following the film, members and guests met at the Parkmoor Recreation Center for refreshment. As a Christmas gift to the Louisville Branch, *Harvie Johnson,* Belke Mfg. Co., reached out from Chicago and picked up the check.

Stanley J. Beyer,
Librarian

Los Angeles Branch

The interest which has developed in the plating industry by the increasing importance being placed on high speed plating baths and solutions yielding bright deposits, and the selection of satisfactory tank linings and equipment, was emphasized at the January 13 meeting of Los Angeles Branch, A.E.S., when a S.R.O. crowd of 105 members and guests appeared to hear a talk on "Corrosion Prevention, Linings and Coatings for Processing Units," by *George R. Bouffard,* chemical engineer for the Barber-Webb Co. of Los Angeles.

The company ranks among the largest corrosion prevention engineering firms in Southern California. It specializes in tank linings and protective coatings, and as fabricators of high impact strength rigid Koroseal ducts, tanks, fumes, hoods, pipes, etc., and also serves as exclusive licensee and applicator in that area for both rigid and flexible Koroseal.

Mr. Bouffard discussed the applications of vinyls, phenolics, furanes, epoxies, polyesters, asphalts, carbon brick and rubber blends to processing equipment, particularly plating equipment.

He called attention to the fact that corrosion prevention now accounts for a five billion dollar volume in industry in general, of which two billion dollars originates in the plating field.

The speaker emphasized that partial protection is of little value. He said that equipment should be maintained with complete protective coatings to eliminate down-time, delay, and confusion in the production operations.

Mr. Bouffard gave separate attention in his talk to natural rubber coatings, synthetics, thermo-plastic and thermo-setting. He also discussed preparation of surface, which he emphasized as a primary requirement; and thickness, application and cost of coatings.

A question and answer period was conducted after the close of the talk. Arrangements for Mr. Bouffard's appearance were made through the

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efforts of Librarian *George Magurean.*

President *John D. Millhorn* presided at the business session. *Earl Coffin* announced the death on January 5th of *Ernest W. Francis,* former owner of The Electroplating Shop in Los Angeles, who was a charter member of the branch. Mr. Coffin reviewed Mr. Francis' 34 years of activity in the plating business in Southern California and Michigan, and then called upon the members to observe a minute of silence in memory of the departed member.

The membership drive under the direction of first vice-president *G. Stuart Krentel* is moving along under a full head of steam, as was shown by the substantial number of new members and applications processed at the January meeting. Inducted were *Ray Morgan, Matty Bassoon, Fred L. Weiss* and *H. W. Smith.* Applications from eight others were received for processing at the February meeting.

It was announced that *William Nairne,* general chairman of the 1954 annual educational session in March, would spend the next several weeks taking an indoctrination course at the main office of the Hanson-Van Winkle-Munning Co. in Matawan, N. J. To assure that no disruption in the planning of the March session would occur, president Millhorn requested *George Hetz* of the Mefford Chemical Co. to take over as arrangements chairman, a post George handled with outstanding success in 1953.

Jackson-Lansing Branch

The regular January meeting of the Jackson-Lansing Branch and guests gathered at the Meadow Lark Inn, Jackson, Mich., for another interesting and instructive occasion.

After a soul satisfying dinner of steak with trimmings, it was our privilege to hear *Dr. B. F. Lewis* of Northwest Chemical speak on cleaning problems with varying electroplating and other finishes. Dr. Lewis always is an interesting speaker with an ever renewing confidence in the future and the ability to overcome intricate difficulties as they arise. Our thanks and appreciation to Dr. Lewis.

A meeting of the board of directors followed, regular meeting completed the business of the day.

R. W. Redmond,
Publicity

Buffalo Branch

William J. Neill, Past Supreme President of the Society addressed the Buffalo Branch on January 8, 1954. His subject was Copper-Tin Alloy Plating on Castings. Mr. Neill discussed plating of three types of copper-tin alloys: 8-10%, 17-21%, and 40-50%. These alloys are plated from a potassium copper cyanide solution containing a complex stannous polyphosphate compound and an addition agent for grain refinement. They were developed by Battelle Memorial Institute in conjunction with Columbus Metal Products and are known a "Lustralite."."

The 8-10% alloy has the appearance of commercial bronze, has much greater resistance to corrosion than the ordinary copper, copper-tin or copper-zinc deposits of equal thickness. It is used for applying an impervious surface to porous castings for use in high (2,000 PSI) pressure pumps and valves. This alloy also acts as a bearing metal, is wear resistant and easily machined. Maintenance is normal to alloy plating baths.

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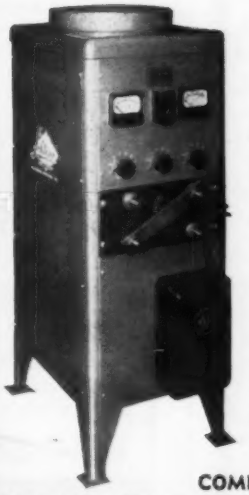

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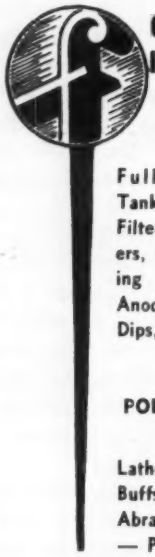

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Eric G. Sampson,
Secretary

Bridgeport Branch

The regular business and educational session of the Bridgeport Branch was held in the main ballroom of the Hotel Barnum on Friday, January 8, 1954.

President *Consalvo* called the meeting to order at 8:30 P.M. at which time 30 members and guests were in attendance. Wm. A. Beibel of Louvain St., Bridgeport was elected an active member.

Henry Maskowski, chairman of the Xmas Dinner Dance reported on the success of the recent Xmas Party held in the Winter Quarters of the Hotel Barnum. An exceedingly good time was had by all who attended and a rising vote of thanks was tendered the chairman and the committee.

R. Bonazzo, librarian, requested permission to schedule a tentative plant visitation in conjunction with the regularly scheduled meeting at Electrolux Corp. on some night other than Friday. A motion to that effect was made and seconded. There being no objection it was so passed.

Frank Kalafus made a motion to elect *Ray O'Connor* an honorary member of the Bridgeport Branch. In his eulogy Mr. Kalafus outlined the achievements of Mr. O'Connor in the plating field; of his efforts in behalf of the interests of the Bridgeport Branch; of his contributions to communal projects; also of his activities with the National Society. The motion was seconded and it was passed unanimously. In his acceptance speech Mr. O'Connor expressed his sincere gratitude to the members for being so honored and expressed his desire to fulfill any of the obligations implied.

Wm. Ehrencrona was appointed chairman of the forthcoming Old Timers' Nite. At this time the name of *George Hogaboom* was mentioned and Mr. O'Connor asked permission to review in brief the personal magnetism of our departed friend.

Otto Lovens made a motion to set aside a page in memory of George B. Hogaboom. It was seconded and passed.

At 8:55 P.M. the meeting was turned over to Mr. Bonazzo, who introduced *Guy Cummings* of Frederick B. Stevens Co.

Mr. Cummings' talk, "Power Supply in the Plating Room," was listened to most attentatively. The question and answer period following his talk resolved some problems existing in the experiences of some of the members. At 9:45 P.M. the meeting was adjourned: Television viewing of the scheduled Friday night fight was next in order while refreshments were being served. *Walter Lynch* of F. B.

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Stevens Co., was host for the evening.

Bob Parker

Hartford Branch

The regular branch meeting was held at the Bond Hotel on Jan. 18th and about 55 members and guests turned out on this very cold night. Preceding the meeting a movie taken at the Weirton Steel Co. by *Art Logozzo* was shown of their huge tin plating plant. Following this Mr. Logozzo eulogized our beloved honorary member *George Hogaboom* who had passed away on Dec. 31st.

The guest speaker scheduled for the evening was *Hubert Goldman* of Enthone, Inc., whose subject was "Adhesion of Electrodeposits and New Methods of Cleaning and Oxide Removal." Inasmuch as Mr. Goldman was not able to be present, *William Murray* of the same company gave a very good talk on the same subject.

Mr. Murray briefly pointed out various materials which, when present on the metal, affect the adhesion such as oils, dirt, oxides smuts, metallic salts and acid salts. Many slides were shown indicating how adhesion depends on the surface condition of the metal and how this surface condition influences the structure of the deposited metal. It was shown that the surface of the basis metal may be crystalline, partly crystalline and partly amorphous or entirely amorphous and means of removing this amorphous metal were described such as anodic sulphuric or chromic acid bath, brite dipping, electropolishing and a new alkaline process. Alkaline derusting and descaling were described and the process was demonstrated with a portable apparatus.

The technical chairman for the evening was *Gene Dowling*.

Stanley Platoz,
Secretary

ASSOCIATION OF CONSULTING CHEMISTS AND CHEMICAL ENGINEERS, INC.

The Association of Consulting Chemists and Chemical Engineers, Inc. has reappointed for the 26th time: Robert T. Baldwin, as Execeutive Secretary and Asst. Treasurer and A. B. Bowers, as Directory of Publicity and Asst. Exec. Secretary.

N.A.C.E.

Kempton H. Roll, Lead Industries Association, New York City, has been elected chairman of North East Region, *National Association of Corrosion Engineers*. Also elected to serve during 1954 were *Edward G. Brink*, American Viscose Corp., Marcus Hook, Pa., vice-chairman and *Edwin J. Titsworth*, Koppers Co., Boston, Mass. secretary-treasurer.

George E. Best, Mutual Chemical Co. of America, Baltimore, Md. was elected to a three-year term on the NACE board of directors, effective with the last day of the 1954 N.A.C.E. Conference at Kansas City. He succeeds *L. B. Donovan*, Consolidated Edison Co. of New York, Inc., New York City.

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